Quickie Pulse 6 Service Manual

SUNRISE MEDICAL
MOBILITY PRODUCTS DIVISION

QUICKIE® PULSE 6

©2009 Sunrise Medical Inc.
111425 Rev A

Quickie Pulse 6 Service Manual Contents

Introduction....0.1
Basic Setup....0.2
Multimeter Tutorial....0.3
Health and Safety....0.5
Electro Static Discharge....0.8
Batteries....0.9
VR2 Remote Controller....0.12
VR2 Plugs/Connectors....0.13
R-NET Remote Controller....0.14
R-NET Remote Controller....0.15
R-NET Plugs/Connectors....0.16
Main Wiring Diagram VR2....0.17
Main Wiring Diagram Rnet....0.18
Basic Tool List....0.19

Section1

Battery Connection Test....1.1
Check Battery Wire Harness....1.2
Circuit Breaker Test....1.2
Main Harness....1.2

Section 2

VR2 Remote Controller Display....2.1
The Maximum Speed Indicator Ripples....2.1
The Maximum Speed Indicator Flashes....2.1
Battery Gauge is Steady....2.1
Battery Gauge Flashes Slowly....2.1
Battery Gauge Steps Up....2.1
Battery Gauge Blinks Once Every 2.5 Seconds....2.1
Battery Gauge Flashes Rapidly....2.1

Section 3

VR2 Controller Diagnostic Codes....3.1
One Bar - Low Battery Voltage)....3.1
Two Bars - Left Motor Disconnected....3.1
Three Bars - Left Motor Wiring Trip)....3.2
Four Bars- Right Motor Disconnected....3.3
Five Bars - Right Motor Wiring Trip....3.4
Six Bars - Charger Connected....3.4
Seven Bars - Possible Joystick Trip....3.4
Seven Bars + Speed Profile Indicator Communication Error....3.4
Eight Bars - Possible Control System Trip....3.5
Nine Bars - Solenoid Brake Trip....3.5
Ten Bars - High Battery Voltage....3.5

Section 4

R-net Troubleshooting Procedures....4.1
Chair Will Not Power Up....4.1

Section 5

R-net Fault Codes....5.1
Power Chair Displays a Fault on the Hand Control or Omni....5.1
Table 1, Error Codes....5.1
Example of R-10 Fault Isolation....5.4
Power Chair Will Not Drive Full Speed....5.4
Power Chair Will Not Drive in Creep Speed When Tilted....5.6
Tilt Will Not Operate....5.7

Section 6

Motor/Gearbox Inspection....6.1

Section 7

Removal Procedures....7.1
Battery Removal....7.1
Motor and Gearbox Removal....7.3
Control Module Removal....7.5
Shock Removal....7.7
Front Caster Arm Removal....7.8
Rear Caster Arm Removal....7.10
Front or Rear Caster Fork Removal....7.11
Caster Removal....7.12
Tilt Actuator and Micro-Switch Removal....7.13

Introduction

Please read and follow instructions in this service manual before attempting to troubleshoot or repair this product for the first time.If there is anything in this Service Manual that is not clear, or if you require additional Technical assistance, contact Sunrise Medical at: (800) 333-4000 option 2, then option 1.

Safely troubleshooting and/or repair of this product depends on your diligence in following the instructions within this manual. Sunrise Medical is not responsible for injuries or damage resulting from a person's failure to exercise good judgement and/or common sense.

There are warning symbols used in this document to focus attention on any hazard that could effect the safety of the individual troubleshooting the chairs covered in this Service Manual.

This Service Manual is intended as a troubleshooting guide for the Quickie Pulse 6. Photographs and content may differ from the actual products in some cases due to changes in specifications and other factors.

This Service Manual is intended for use by persons with a basic working knowledge and the skills required in servicing and maintaining Power Wheelchairs. Persons without a General Working knowledge and expertise in the servicing of this product should not carry out troubleshooting procedures. This can result in problems with future servicing, and/or damage to the unit.

Parts and configuration or specifications of Products included in this Service Manual are subject to change without prior notice.

For up to date parts and the latest version of this manual go to:
www.sunmed.com
and click on the Parts Search button

Basic Setup

When setting up the components of the chair, complete the following checklist to ensure proper and safe operation of the equipment.

Check :

□ Are the batteries fully charged?

a. Test battery voltage with D.C. meter across the terminals of batteries. The measurement should be above 12 volts D.C.
b. If not, fully charge the batteries.

□ Are all necessary power components installed and connected ?

a. Input device (normally Joystick)
b. Cable from Joystick to the Bus Line
c. Control Module; for the Pulse located at back of chair behind shroud

□ Are all necessary connections fastened or inserted?

a. Battery connectors to the batteries
b. Cable between Joystick and the Control
c. Both Motor Connectors to the Control Module.

□ Is the Drive Gear engaged?

a. With the power off the chair should not move if pushed from behind.
b. If the chair moves when pushed, refer to proper operation of Drive Gear Engagement section.

□ Does Display light up when Power On/Off switch is depressed?

a. If no - recheck the 4 checks listed above then refer to the section on Diagnostics.
b. If yes – the Power Wheelchair is ready to drive

Multimeter Tutorial

The Multimeter

The multimeter is one of the most useful tools in the toolbox. It can be used to check wires, shorts, voltages, resistance, all manner of electrical circuits. This tutorial is designed to help clarify the symbols and socket options

MULTIMETER

The Probes

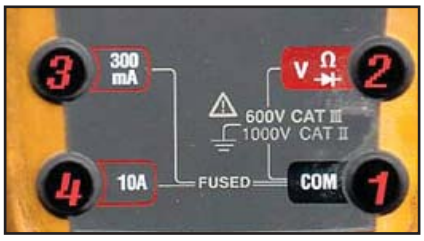
found on various multimeters.
Probes connect the meter to the circuit. Simply touch them to the connections you want to measure and read the display. Obviously, this depends on how the meter is set up, and what is being measured.

PROBES

The Ports

1. The Common Port.
   Generally, the black probe plugs in here (negative) and as the name suggests, it's the common element to all of the testing circuits. Think of it as the ground rail.
2. Voltage, Resistance and Continuity port.
   This is commonly used option. Connect the red (positive) probe to this port when using any voltage readings, resistance readings or when checking wire continuity (explained in more detail later in the tutorial).
3. Current up to 300mA.
   This port is used for "counting electrons" in a circuit, and thus their rate of flow (current being the flow of electrons). You'll notice that this side is "fused", so that you don't end up melting the meter's circuits.
4. Current up to 10A.
   Same as above, except it can take more current, as the name suggests.

PORTS



Symbols

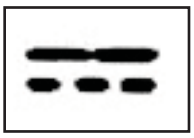
This section describes the basic symbols used in a typical multimeter.

AC

This symbol means alternating current. Use this when you want to test something that has AC current running through it. Typically you'd want to test the voltage of an inverter (for cold cathodes or neons) or a similar device.

DC

This means Direct Current. This is the type of electrical power produced by a battery. With a battery connector, the black wire(s) should be connected to the negative(-) terminal of the battery and should be considered the common ground. The red wire(s) should be connected to the positive(+) terminal of the battery and is considered the "hot" lead.



Voltage

This means Voltage or Potential Difference. This measures the potential difference between the two probes. To measure voltage, connect the positive probe to a port that is marked "V" or Voltage.
Note: "mV" means milli-volts .001 Voltage

Current

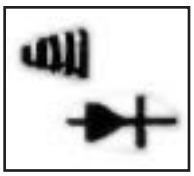
Technically, this term is incorrect. It should be "I" but since current is measured in Amps and the readout value is in amps, the symbol makes sense. This measures the current that is flowing through the part of the circuit between the two probes (the meter itself). Typically, you need to plug the positive terminal into a port marked "A" or Current. You need to put the meter "In Series" in the circuit to use this feature correctly.

Resistance

This symbol means Resistance and is measured in Ohms. You can use this setting to measure the resistance between two points; for example across a piece of wire or a resistor (to check its value). If you don't have a continuity check, then this can be used to check for shorts. Any value below 0.05 Ohms constitutes a short, meaning that whatever the probes are attached to is connected electrically.

Continuity

A commonly used function. Basically, what it does is put a current through the two terminals (the same as the Ohm-meter function) and if the resulting value is within the "contact" range, it will beep. This feature found on some multimeters enables you to check for shorts without taking your eyes off your work. Other meters may have a light that turns on when a short is found.



Good Working Practices

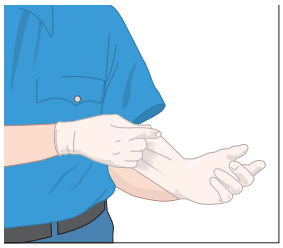
While working on powered mobility products, it is essential to observe good working practices. Below are a series of safety guidelines and recommendations. Please note that these precautions are intended to serve only as a guide, not to supersede or replace any safety statute, NHS or other safety regulations.

General

- Always wear suitable protective clothing when handling batteries.
- Always wear suitable eye protection when drilling or inspecting.
- When safe to do so, wear protective gloves when handling the running gear or batteries, as these parts are exposed to paths, parks etc.
- If the drive wheels have to be raised off the floor, always use a pair of axle stands to secure the vehicle.

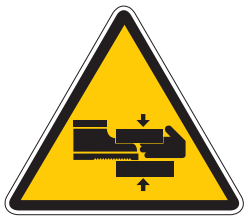
Battery Safety

- Use extra caution when working with batteries.
- Always make sure that the batteries are disconnected from the vehicle before commencing work.
- Always check that the battery charger is disconnected from the vehicle / batteries before commencing work.
- Do not smoke.
- Keep batteries away from all sources of ignition.
- Do not place objects on the battery tops.
- Always try to keep someone within earshot of your work area so that they may come to your assistance if needed.



- Always wear personal protection when handling batteries, including, eye/face protection and gloves.
- Make sure there is easy access to soap and water in case of acid spills.
- Avoid touching eyes or unprotected parts of the body while working on batteries.
- Remember that non-sealed batteries can contaminate any packaging, housing, or boxes they may have been transported in so handle all packaging with care, especially during disposal.
- If battery acid should come into contact with bare skin or clothing, be sure to wash contacted area immediately, using plenty of soap and water. If battery acid enters the eyes, flush with running cold water for as long as possible while medical help is being sought.
- When the tops of batteries are exposed, take extra care when working on or around the terminals.
- Do not allow metal tools to drop on to or touch the exposed terminals of the batteries or other exposed connections, as this could cause a short circuit, which may result in an explosion.

- Remove personal items of jewelry, such as rings, watches, chains etc. before working on batteries. Such items could cause short circuits resulting in serious burns.
- Batteries are constructed of heavy materials. Therefore moving batteries requires appropriate lifting techniques. Safety footwear should also be worn. In addition, disposal of old batteries requires correct procedures. Contact your local authority for their recommendations.



Battery Chargers

- Remember battery chargers are connected to household current.
- Always observe all guidelines and laws relating to electrical equipment.
- Never operate the battery charger in wet or damp conditions.
- If you think that the charger has been exposed to water or excessive dampness, do not use it. Return the unit to the dealer/supplier for inspection/replacement.
- If you think the battery charger is defective or is visibly damaged, return the unit to the dealer/supplier for inspection.

EMI Warnings

- EMI means electromagnetic (EM) interference (I). EMI comes from radio wave sources, such as radio transmitters and transceivers. A “transceiver” is a device that both sends and receives radio wave signals.)
- There are a number of sources of intense EMI in our daily environment. Some of these are obvious and easy to avoid. Others are not, and we may not be able to avoid them.
- Powered wheelchairs, although tested in accordance with EMC guidelines, may be susceptible to electromagnetic interference (EMI) emitted from sources such as, radio stations, TV stations, amateur radio (HAM) transmitters, two-way radios, and cellular phones.
- EMI can also be produced by conducted sources or electro-static discharge (ESD).

What effect can EMI have?

1. EMI, without warning, can cause a power chair to:
   - Release its electronic brakes
   - Move by itself
   - Move in unintended directions.
   - If any of these occur, severe injury could result.

2. EMI can damage the control system of a power chair, resulting in a safety hazard and/or costly repairs.

Sources of EMI

1. Hand-Held Transceivers: The antenna is usually mounted directly on the unit. These include:

- Citizens band (CB) radios
- “Walkie-talkies”
- Security, fire and police radios
- Cellular phones
- Lap top computers with phone or fax
- Other personal communication devices

Note - These devices can transmit signals while they are on, even if not in use. The wheelchair should be switched off when not in use.

2. Medium-Range Mobile Transceivers: These include two-way radios used in police cars, fire engines, ambulances and taxi cabs. The antenna is usually mounted on the outside of the vehicle.

3. Long-Range Transceivers: These include commercial radio and TV broadcast antenna towers, amateur (HAM) radios and alarm systems in department stores.

NOTE- The following are Not likely to cause EMI problems: Lap-top computers (without phone or fax), cordless phones, TV sets or AM/FM radios, CD or tape players.
EM energy rapidly becomes more intense as you get closer to the source. For this reason, EMI from handheld devices is of special concern. A person using one of these devices can bring high levels of EM energy very close to a power chair without the user’s knowledge.

Immunity level

The level of EM is measured in volts per metre (V/m). Every power wheelchair can resist EMI up to a certain level. This is called its “immunity level”. The higher the immunity level, the less the risk of EMI. It is believed that a 20 V/m immunity level will protect the power wheelchair user from the more common sources of radio waves.

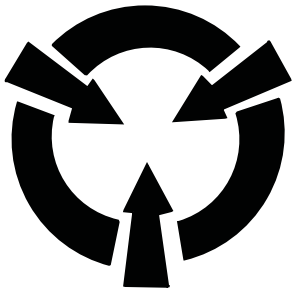
The configuration tested and found to be immune to at least 20 V/m is: Pulse 6 power wheelchair with a right-handed mounted joystick system, 18” seat width, 18” seat depth, dual-post height-adjustable armrests, fixed tapered legrests with one-piece solid footplate and Gp 24 gel cell batteries.

The following dealer installed speciality input devices have an unknown effect on the immunity level because they have not been tested with the Quickie control systems:

- Breath Control (“Sip n Puff”)
- Tri-Switch Head Array
- Proximity Head Array
- Proportional Mini-Joystick/Chin Control
- Buddy Button
- Wafer Board

Electro Static Discharge

To help prevent Electro Static Discharge (ESD) the following proper handling techniques should be followed:



ESD:

- Do not place Printed Circuit Boards or their containers near sources of strong electrical fields (such as above a CRT).
- To avoid the occurrence of static charge or discharge due to friction, keep the Printed Circuit Boards separate from one another and do not stack them directly on top of one another if not protected by antistatic bags.
- Store each Printed Circuit Board in an antistatic bag with an external cushioning bubble-wrap layer until assembled to wheelchair. Antistatic bag must have metal content to protect the printed circuit board. Gray bag protects from ESD, pink bag or bubble wrap does not protect as well.
- Always wear an ESD preventive wrist or ankle strap when handling electronic components. Connect one end of the strap to an ESD jack or an unpainted metal component on the system (such as a captive installation screw).
- Handle Printed Circuit Boards by the edges only; avoid touching the Printed Circuit Board and connector pins.
- Place any removed Printed Circuit Board on an antistatic surface or in a static shielding bag.
- Avoid contact between the Printed Circuit Boards and clothing. The wrist strap only protects the card from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Make sure that the Printed Circuit Board power is off by disconnecting the seating harness prior to attaching or removing printed circuit board.

Printed Circuit Board Flexing:

- The printed circuit board has surface-mount components that may break when the board is flexed. To minimize the amount of board flexing, observe the following precautions:
- Hold the printed circuit board only by the edges.
- Do not place the printed circuit board on a hard surface.
- Tighten board mounting screws only hand tight (torque12.4 in lbs/1.4Nm) in a cross pattern to reduce stress on mounting holes and PCB board material.

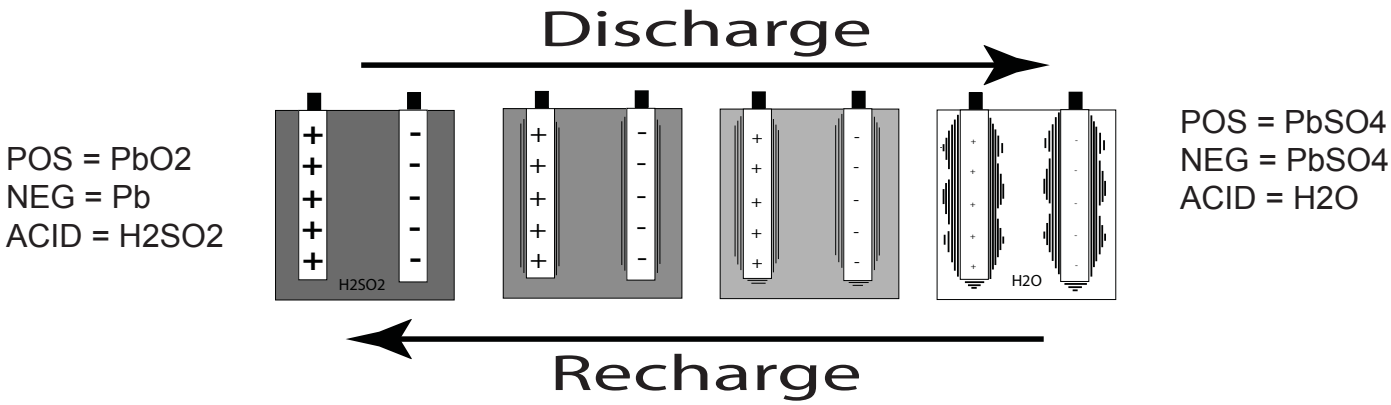
Batteries

Safety

If mishandled batteries can be dangerous and hazardous.

- All mobility batteries, whether wet type or gel/sealed type, contain lead and sulfuric acid. Both of these materials are toxic and in the case of sulfuric acid, highly corrosive. Additionally, when batteries are charged, they produce hydrogen gas which is “highly” flammable and can cause explosion. This is why proper handling is mandatory at all times.
- Battery explosion - This is frequently the result of too low an acid/ electrolyte level in the battery, which allows high concentrations of hydrogen to build up. This is possible with all batteries if improper charging or battery failure occurs, but not common in gel/sealed batteries.
- < KEEP SPARKS AND FLAMES AWAY FROM BATTERIES >
- Burns - dropping a wrench or screwdriver across battery terminals results in sparks, and intense heat. Improper assembly of battery boxes or battery box wiring may short the battery through the wiring and produce a possible electrical fire.
- Electronic damage - batteries that are improperly wired can short out electronic chair components resulting in expensive repairs.
- Pollution - improper disposal of batteries could damage the environment. All batteries should be disposed of through a reliable battery recycler.

Battery Charge Cycle Illustration
Typical Flooded Battery



As battery discharges, the sulfate from the electrolyte forms on the plates.
As battery recharges, the sulfate is driven back into the electrolyte

Battery Diagnostics

Batteries should last an average of 1 to 1.5 years.
Factors that affect battery performance:

- Maintenance - Poor maintenance.
- Charging - Improper charging shortens battery life.
- Chair Components - Malfunctioning electronics, bad motors, electric brakes, and corroded wiring are just some of the factors that may affect battery life and performance.

Battery Servicing and Replacement
Automobile batteries, which are used for starting, are tested with a load tester to assure a high rate of energy production in a short burst.

The voltmeters on load testers are not accurate enough to establish a state of charge.

Deep-cycle batteries produce energy more slowly and are designed to hold up to constant discharging and recharging. Testing a deep-cycle wheelchair or scooter battery requires different procedures than an automobile battery.

A routine for testing deep-cycle batteries should follow these guidelines:

Never replace just one battery at a time. This will create an imbalance when charging and ultimately damage both batteries.

Check batteries for a voltage difference. A voltage difference of more than .4 volts D.C. is a true indicator of a bad battery.

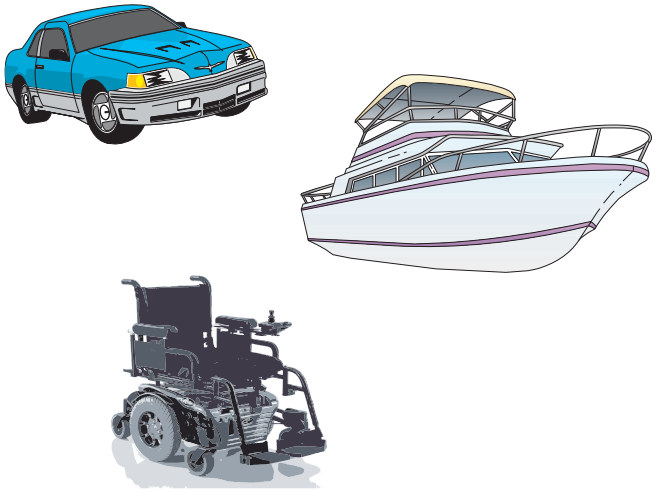
Voltage test - A dead battery cannot be effectively tested, yet many people mistakenly try to do just that.
Any battery that reads 11.0 volts or less is technically dead.

To perform any testing, especially a load test:
A. Batteries must be charged
B. The top charge must be taken from fully charged batteries if charge rate has just finished.

- *Load Test* - This test can only be done on fully charged batteries and can diagnose one type of problem, an internal short.
- *Capacity/ Discharge Test* - This is the only accurate way to test a deep-cycle battery for adequate running time. The problem with this test is that it is time consuming.
- *Current / Voltage check with a regular interval check* - Another way of truly knowing how much time your battery will last is also time consuming.

Battery Types

REMEMBER: IT IS THE RESPONSIBILITY OF THE INSTALLER TO KNOW WHAT KIND OF BATTERIES TO INSTALL IN THE CUSTOMER'S WHEELCHAIR!



- Deep-cycle batteries are designed to be discharged and recharged on a regular basis.
- Starting or automotive type batteries use a rapid burst of power to start an engine and are quickly recharged by an alternator or generator. They are rated by cold cranking amps, a measure that has no relevance to wheelchair application.
- Marine and RV batteries frequently are not deep-cycle as they are often used for starting engines.
- **Only use Deep-Cycle sealed type batteries in a wheelchair.**

Battery Size

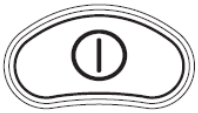
- Batteries function as a power wheelchair's fuel tank. The larger the group size, the farther the wheelchair will go.
- Use the size specified by the wheelchair manufacturer. Never use undersized batteries.

22 NF

VR2 Remote Controller

VR2 Controller Buttons

Battery Gauge
A series of ten LED's, which indicate charge level.



On/Off Key- Press to power on or off the power chair or Controller.

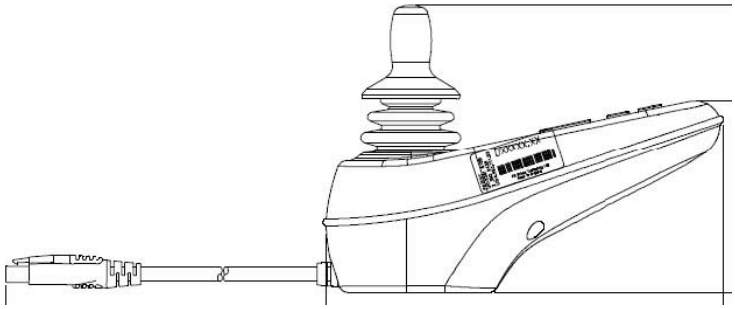
Horn Key- Activates a warning horn.

Speed/Profile indicator- A series of five LED's, whichdisplay speed and profile settings

Speed/ Profile Decrease. Used to decrease the Speed/ Profile setting.

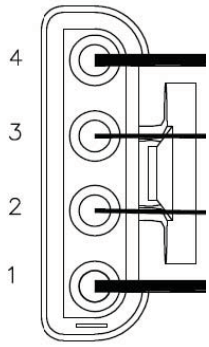
Speed/ Profile Increase. Used to Increase the Speed/ Profile setting.

VR2 Plugs/Connectors



4pin

charger port

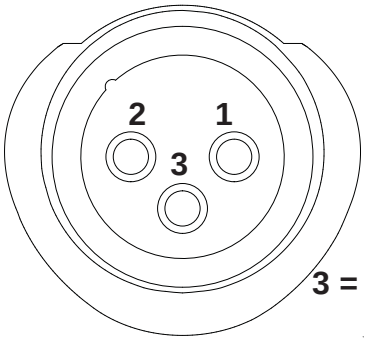


4 = Red (+)

3 = Yellow

2 = White

1 = Black (-)



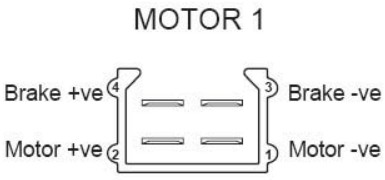
1 = 24 Vdc

2 = 0 Vdc

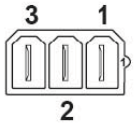
3 = Inhibit 1/ Programmer

Charger port
Outside View

Motor Plug Port

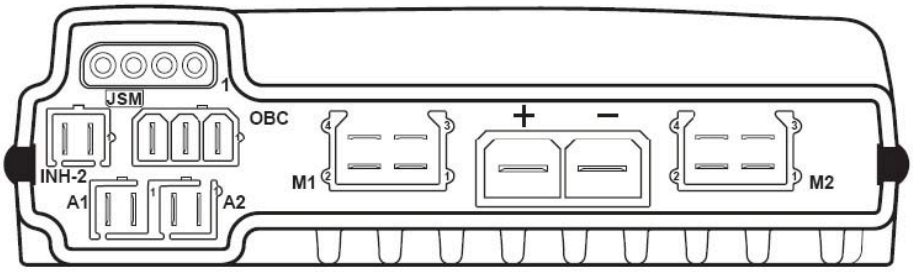


On-Board Charger (not used)



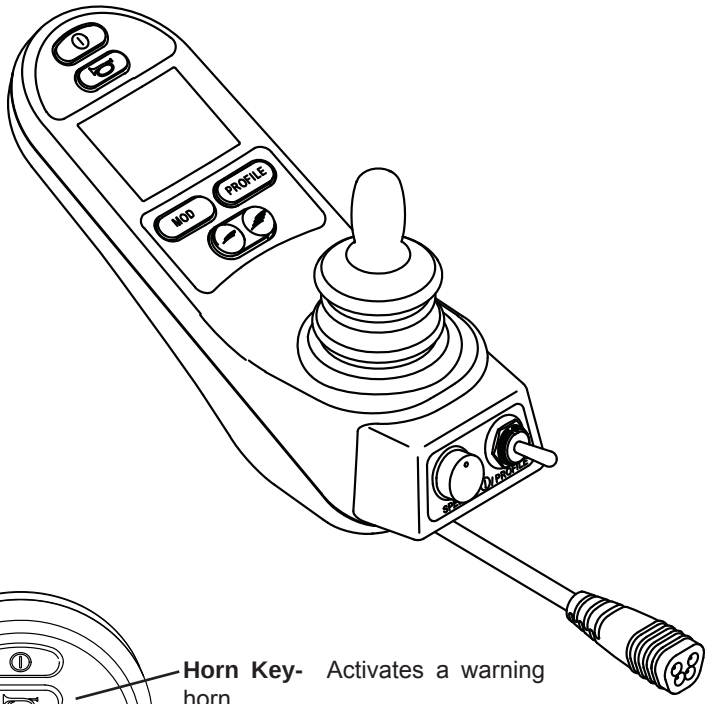
1 = 24 Vdc
2 = 0 Vdc
3 = INHIBIT 1/ PROGRAMMER

VR2 Controller



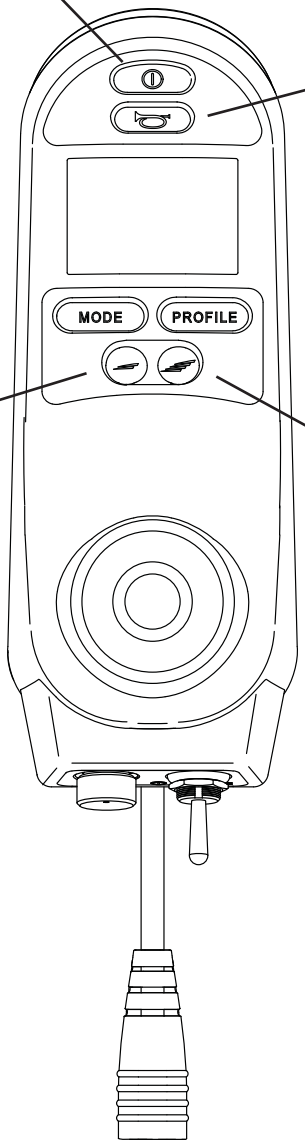
M1 = RIGHT SIDE MOTOR
M2 = LEFT SIDE MOTOR
JSM = JOYSTICK MODULE
INH-2 = INHIBIT 2
A1 = ACTUATOR 1
A2 =ACTUATOR 2
OBC = ON BOARD CHARGER
+ - =BATTERY

R-NET Remote Controller



On/Off Key- Press to power on or off the power chair or Controller.

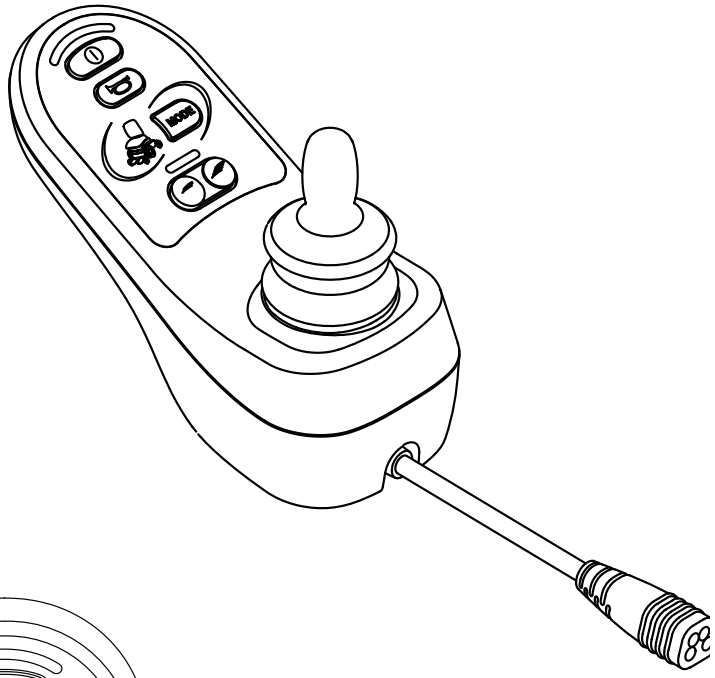
Horn Key- Activates a warning horn.

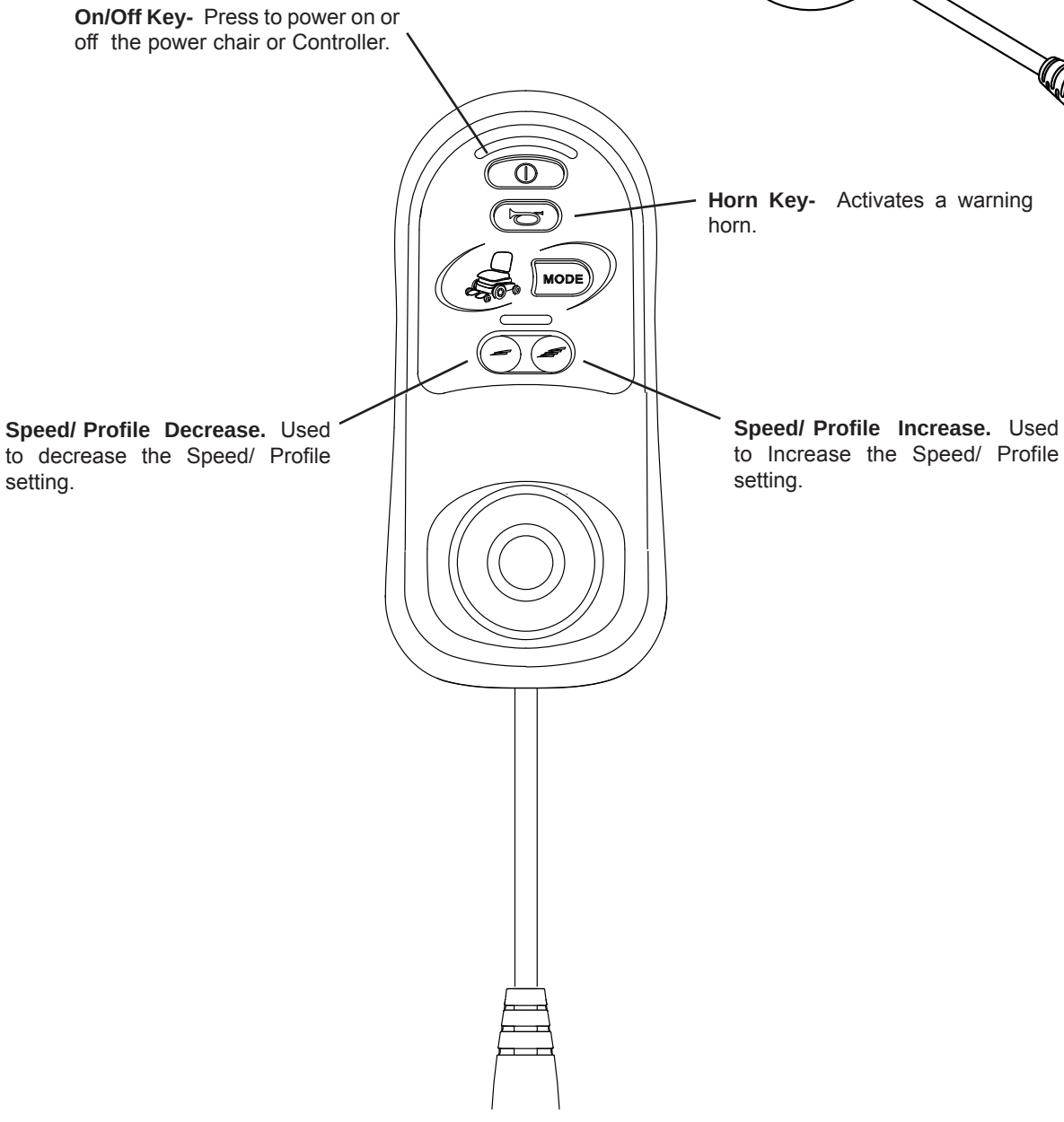


Speed/ Profile Decrease. Used to decrease the Speed/ Profile setting.

Speed/ Profile Increase. Used to Increase the Speed/ Profile setting.

R-NET Remote Controller





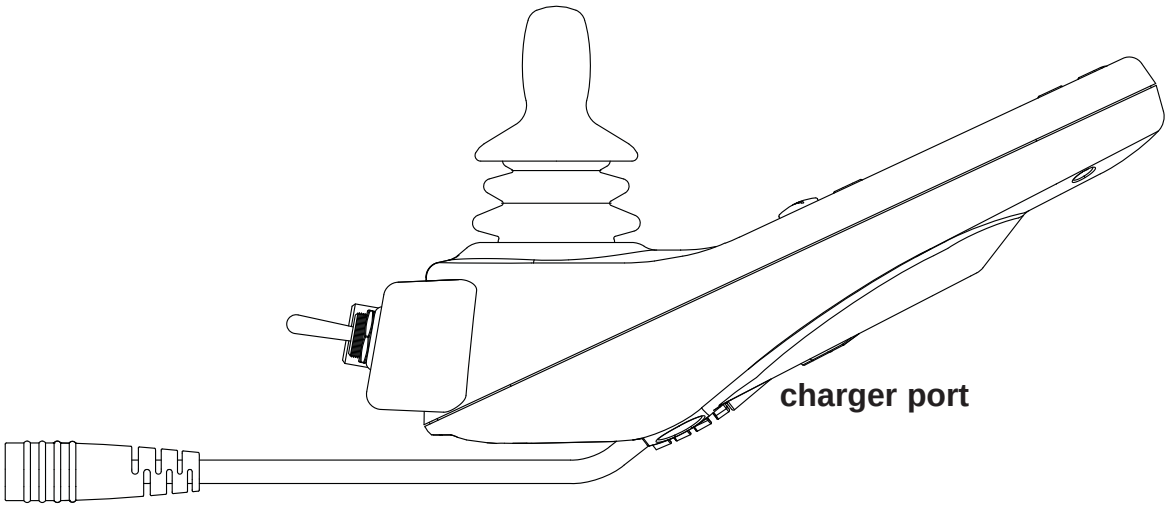
On/Off Key- Press to power on or off the power chair or Controller.

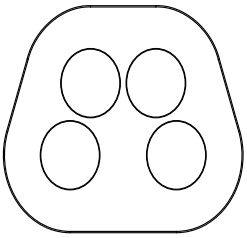
Horn Key- Activates a warning horn.

Speed/ Profile Decrease. Used to decrease the Speed/ Profile setting.

Speed/ Profile Increase. Used to Increase the Speed/ Profile setting.

R-NET Plugs/Connectors



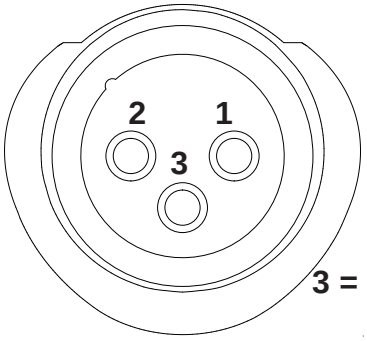


4 = Red (+)

3 = Yellow

2 = White

1 = Black (-)



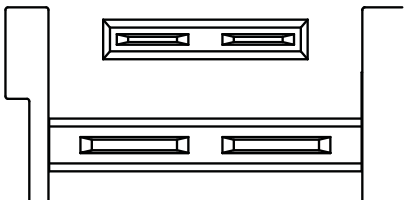
1 = 24 Vdc

2 = 0 Vdc

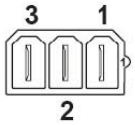
3 = Inhibit 1/ Programmer

Charger port
Outside View

Motor Plug Port

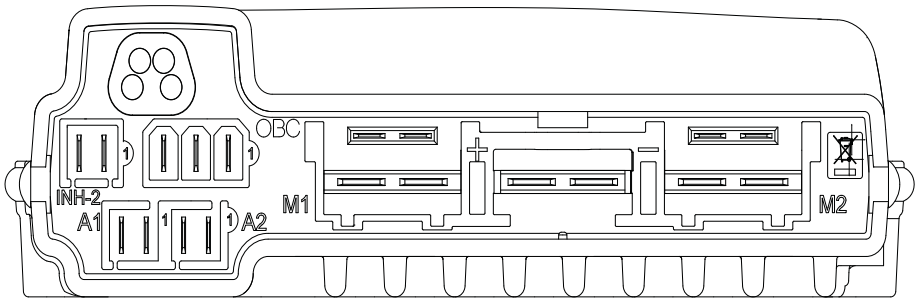


On-Board Charger (not used)



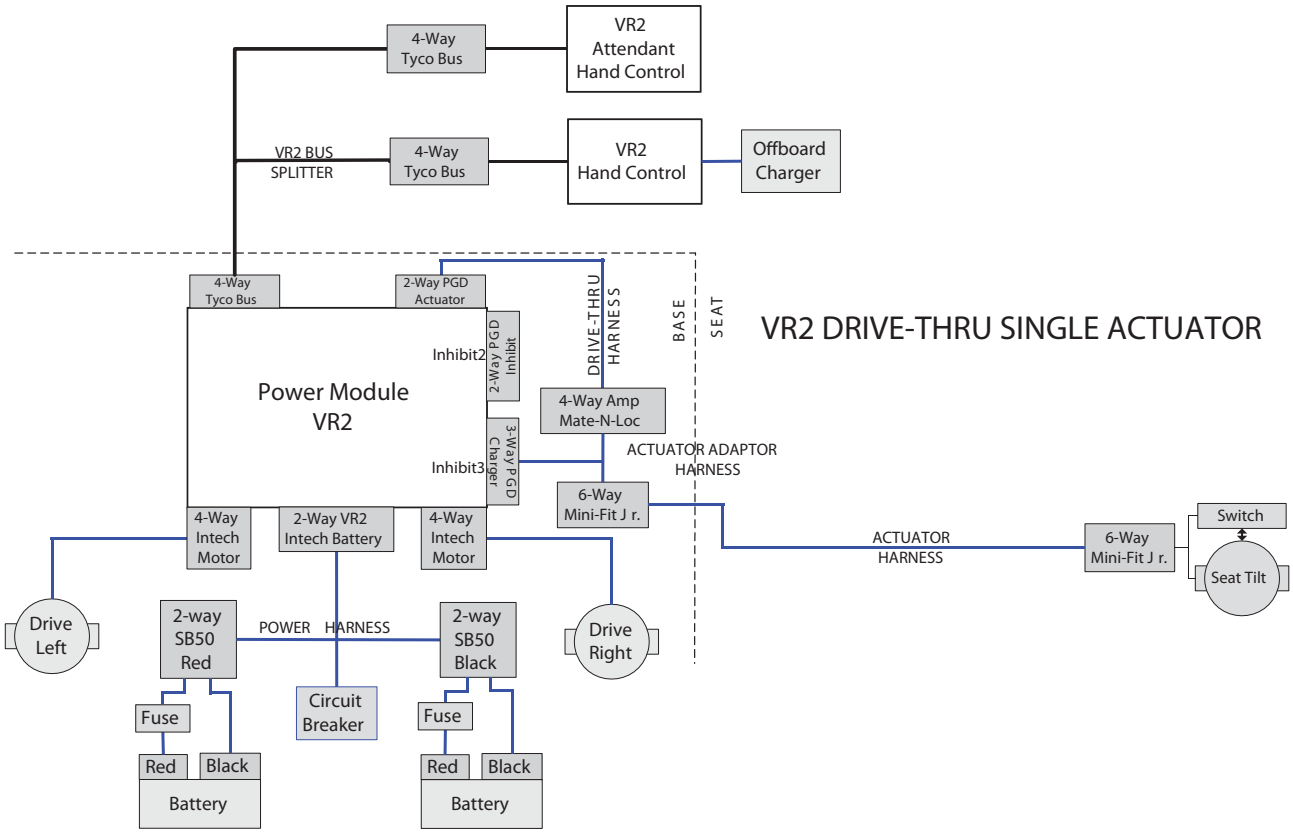
1 = 24 Vdc
2 = 0 Vdc
3 = INHIBIT 1/ PROGRAMMER

Rnet Controller

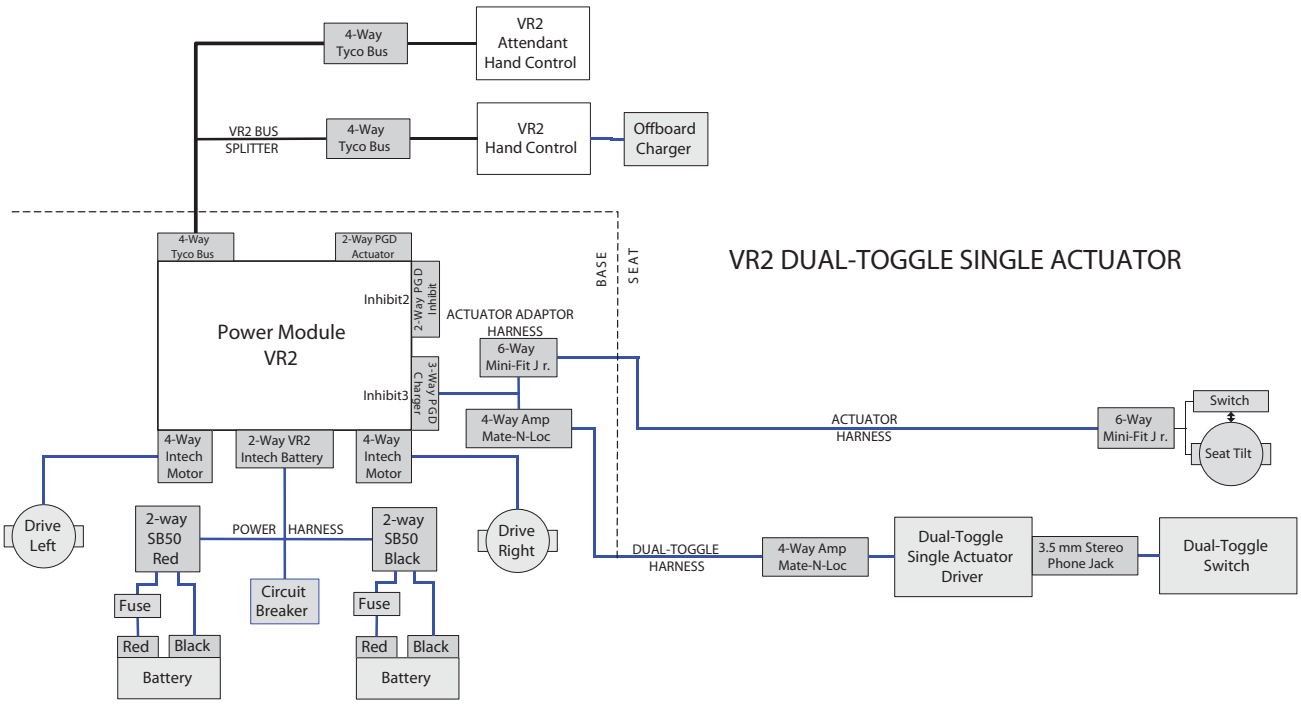


M1 = RIGHT SIDE MOTOR
M2 = LEFT SIDE MOTOR
JSM = JOYSTICK MODULE
INH-2 = INHIBIT 2
A1 = ACTUATOR 1
A2 =ACTUATOR 2
OBC = ON BOARD CHARGER
+ - =BATTERY

Main Wiring Diagram VR2

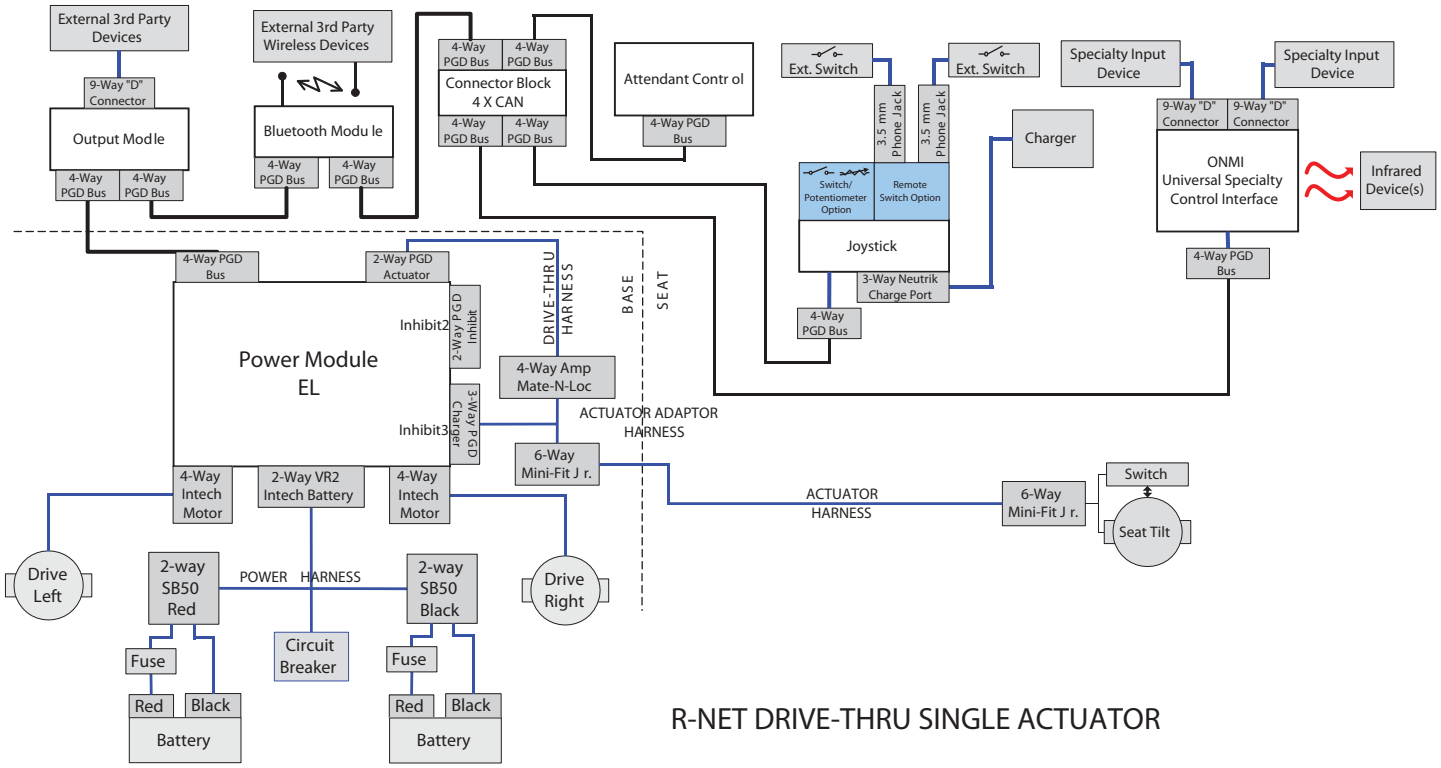


VR2 DRIVE-THRU SINGLE ACTUATOR

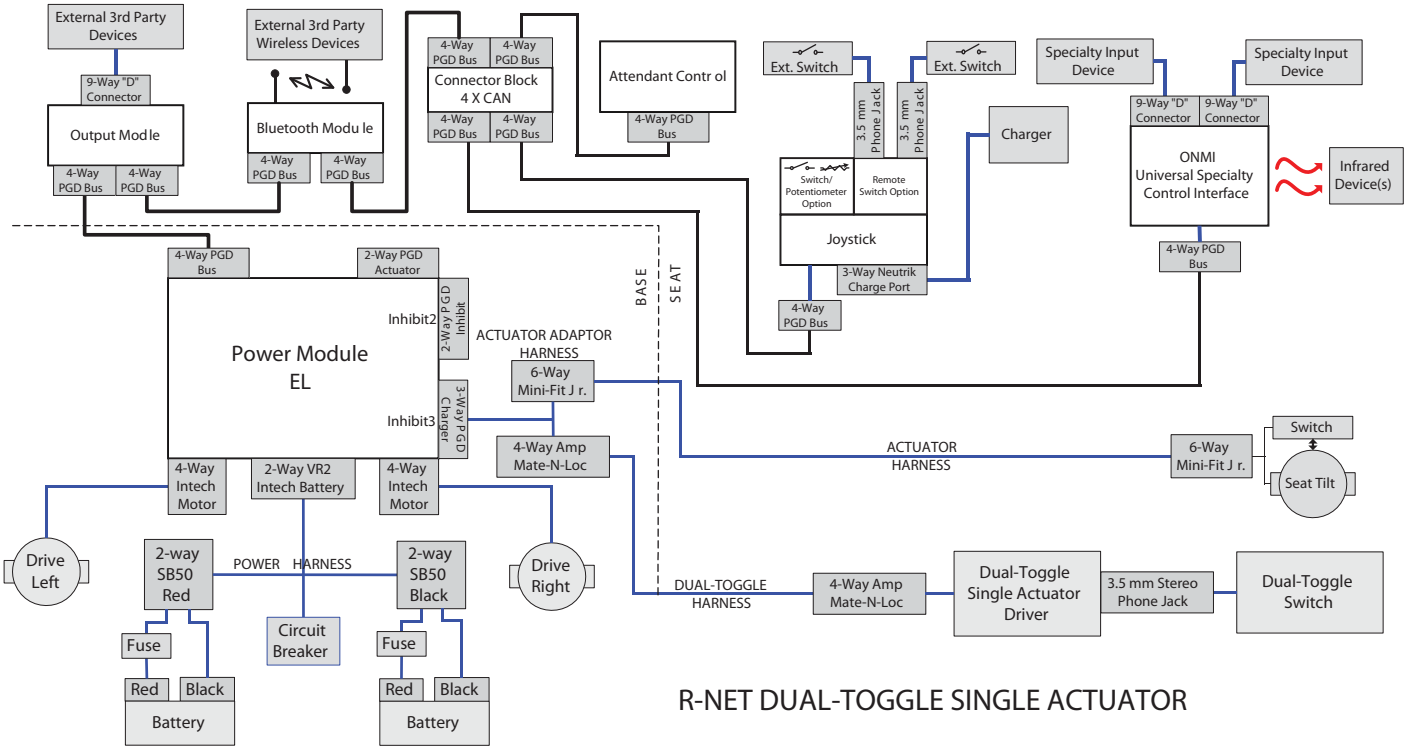


VR2 DUAL-TOGGLE SINGLE ACTUATOR

Main Wiring Diagram Rnet



R-NET DRIVE-THRU SINGLE ACTUATOR



R-NET DUAL-TOGGLE SINGLE ACTUATOR

Basic Tool List

Basic Tool List

The following list of tools should enable any task to be dealt with. Some will only occasionally be needed, but it is advisable to own or have access to them.

- 17mm Deep Socket wrench
- 13mm combination wrench
- Cutter for zip-tie
- Needle nose pliers
- 5mm Allen wrench
- 3/8 combination wrench
- Phillips screwdriver #2
- 18mm combination wrench
- Flat blade screwdriver
- 19mm socket wrench
- 5mm socket wrench

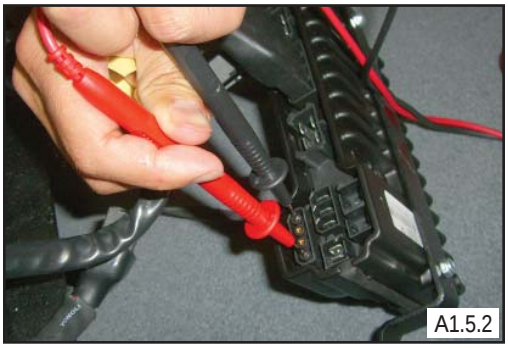
Troubleshooting: No Power (cont.)

Battery Connection Test

1. Check that the female VR2 Bus plug on the chair has voltage. Set the meter to DC volts and measure pins 4 (using the red lead of the meter) and 1 (using the black lead of the meter) as shown in (fig A1.5.1)

A1.5.1

2. If the voltage meter reads full voltage, then replace the joystick module
If the voltage meter reads zero voltage measure the corresponding pins on the VR2 controller as shown in (figure 1.5.2).
If the voltage meter reads full voltage, then replace the jumper cable. If the voltage meter reads zero, then measure the Battery Connector as shown in (fig 1.5.3).If the voltage meter reads full voltage, then replace the controller, or else proceed to the next step.



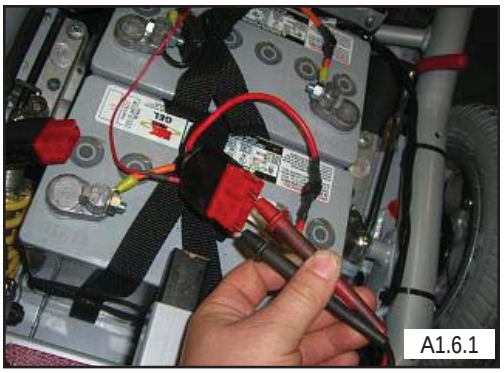
A1.5.2

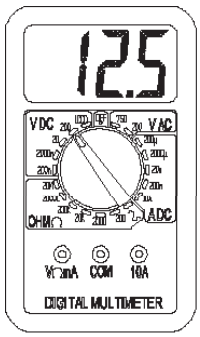
A1.5.3

Troubleshooting: No Power (cont.)

Check Battery Wire Harness

Check that the battery wire harness has the polarity correct. Set the meter to dc volts and measure the connector with the red lead on the + terminal and the black lead on the negative terminal as shown in (figure 1.6.1) If both the battery wire harness have full voltage and correct polarity, then proceed to circuit breaker test. If the voltage is absent proceed to battery fuse test. If the polarity is reversed correct battery wiring.

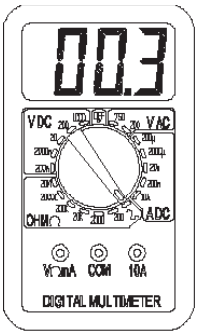

A1.6.1



Battery Fuse

Check that the battery fuse is in good condition. With the batteries disconnected, set the meter to ohms and measure the resistance across the fuse. see (figure A1.7.1). If the meter reads more than one ohm, change the wiring harness, or else proceed to the next step.

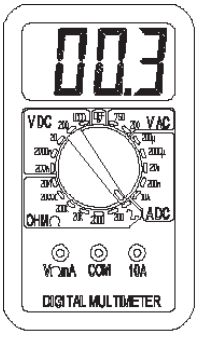
A1.7.1



Circuit Breaker Test

To check the circuit breaker set the meter to ohms and measure the resistance across the circuit breaker as shown in (figure A1.8.1). If the meter reads more than 1 ohm, then change the circuit breaker, otherwise proceed to next step.

A1.8.1



Main Harness

If the above steps did not correct the problem, change the main harness.

Section 2

VR2 Remote Controller Display

The Maximum Speed Indicator Ripples

Indicates that the wheelchair is locked. To unlock the wheelchair, deflect the joystick forwards until the control system chirps. Then deflect the joystick in reverse until the control system chirps. Release the joystick, there will be a long beep. The wheelchair is now unlocked. To lock the wheelchair, while the control system is switched on, depress and hold the on/off button. After 1 second, the control system will chirp. Now release the on/off button, deflect the joystick forwards until the control system chirps, and deflect the joystick in reverse until the control system chirps. Release the joystick, there will be a long beep. The wheelchair is now locked.

The Maximum Speed Indicator Flashes

This indicates that the chair is charging . The chair will be ready to drive as soon as the charger is unplugged.

Battery Gauge is Steady

This indicates that all is well.

Battery Gauge Flashes Slowly

The control system is functioning correctly, but you should charge the battery as soon as possible. At 22 V, the red light starts to blink. Each bar represents a .5V value. The controller requires 18V to start and a minimum of 16V to work once started

Battery Gauge Steps Up.

Indicates the wheelchair batteries are being charged with the offboard charger. You will not be able to drive the wheelchair until the charger is disconnected and you have reset the control system by switching off the power and then powering up again.

Battery Gauge Blinks Once Every 2.5 Seconds

The control system has "gone to sleep" because the wheelchair has not been driven for a period of time. The time period depends on the programming of the system. To re-start, reset the system by switching off the power and then powering up again.

Battery Gauge Flashes Rapidly

Make sure the Joystick is completely released (Joystick should be centered and/or nothing is pushing the gimbale out of center). The control system safety circuits have been activated and the control system has been prevented from moving the wheelchair. This indicates a system trip, i.e. the VR2 has detected a problem somewhere in the wheelchair's electrical system. Please refer to Section 3 (VR2 Controller Diagnostics).

Section 3

VR2 Controller Diagnostic Codes

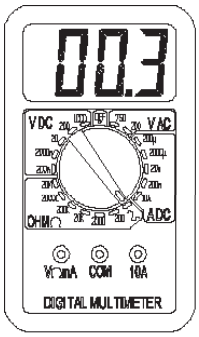
One Bar - Low Battery Voltage)

This code could indicate discharged batteries, failed batteries, or poor battery connections. Begin by recharging the batteries and then refer to Section 1 to check batteries and connections.

Two Bars - Left Motor Disconnected

Check that the batteries are fully charged and in good condition; and check all cables and connections. Check the connections to the left motor, look for a loose or damaged connector.

Use the meter to check the resistance across the two bottom contacts (thicker wires) on the 4-pin motor connector as shown in (figure A3.2.2). If the meter reads between 0 to 1.5 ohms, then replace the controller. If none of the above corrects the problem, replace the left motor.



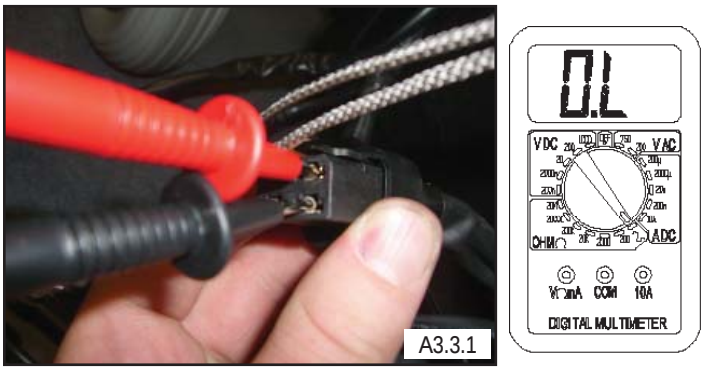
Otherwise, check the brushes on the left motor (Figure A3.2.1). Ensure that they are not excessively worn. Replace as required.

VR2 Controller Diagnostics Codes (cont.)

Three Bars - Left Motor Wiring Trip)

Check that the batteries are fully charged and in good condition; and check all cables and connections. Check the connections to the left motor, look for a loose or damaged
connector.

Measure the resistance from the bottom contact of the red thick wire on the 4-pin left motor connector to each of the top contacts of the connector (figure A3.3.1). Measure the resistance from the bottom contact of the black thick wire on the 4-pin left motor connector to each of the top contacts of the connector see (below right). If all of the readings are open, then replace the controller. If any of the readings are short, then replace the left motor.



Test 1

Test 2

Test 3

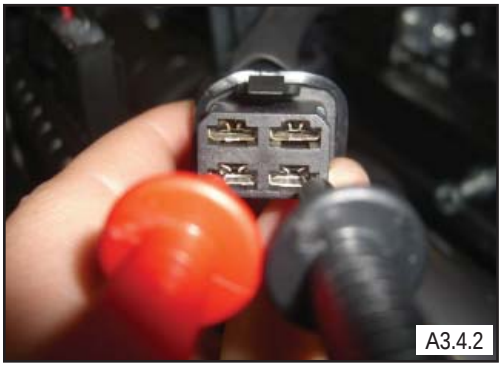
Test 4

VR2 Controller Diagnostics Codes (cont.)

Four Bars- Right Motor Disconnected

Check that the batteries are fully charged and in good condition; and check all cables and connections. Check the connections to the right motor, look for a loose or damaged connector.

Use the meter to check the resistance across the two bottom contacts of the thicker wires on the 4-pin motor connector as shown in (figure A3.4.2). If the meter reads between 0 to 1.5 ohms, then replace the controller. If none of the above corrects the problem, replace the right motor.

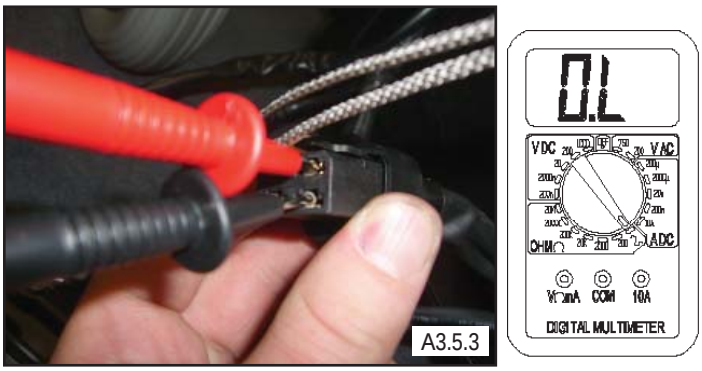


Otherwise, check the brushes on the right motor (Figure A3.4.1). Ensure that they are not excessively worn. Replace as required.

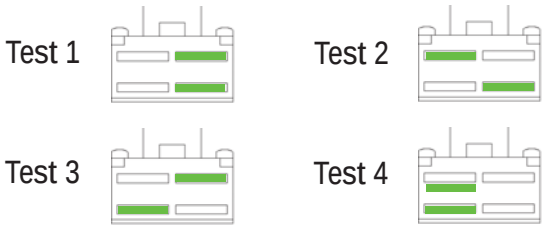
VR2 Controller Diagnostics Codes (cont.)

Five Bars - Right Motor Wiring Trip

Check that the batteries are fully charged and in good condition; and check all cables and connections. Check the connections to the right motor, look for a loose or damaged connector.



If the reading is short (resistance is less than 10 K ohms) on any of the readings, proceed to check the 4-pin motor connector. Measure the resistance from the bottom contact of the red thick wire on the 4-pin right motor connector to each of the top contacts of the connectors see (figure A3.5.3). Measure the resistance from the bottom contact of the black thick wire on the 4-pin right motor connector to each the top contacts of the connector (below right). If all of the readings are open, then replace the controller. If any of the readings are short, then replace the right motor.



Six Bars - Charger Connected

The Onboard Batteries are being charged with the off-board charger. You will not be able to drive the wheelchar until the charger is disconnected. You will have to reset the control system by switching off the power and the Powering up again. The On-Board charger has no indication that the chair is charging, and the chair will not move until complete.

If the condition still exists after the charger has been diconnected and the chair has been switched off and powered up again, the Joystick module may be defective.

Seven Bars - Possible Joystick Trip

A joystick trip is indicated. Make sure that the joystick is in the center position before switching on the control system.

Check that the batteries are fully charged and in good condition, examine the joystick for damage. This fault can be caused by a joystick that fails to center itself due to being dirty, bent or broken. If this is the case, replace the joystick module.

Note: If replacing the joystick does not resolve the issue, replace the cable connecting the joystick to the controller.

Seven Bars + Speed Profile Indicator Communication Error

Inspect wiring between joystick module and controller. Replace the jumper or joystick module with damaged wiring. If the problem persists replace the controller.

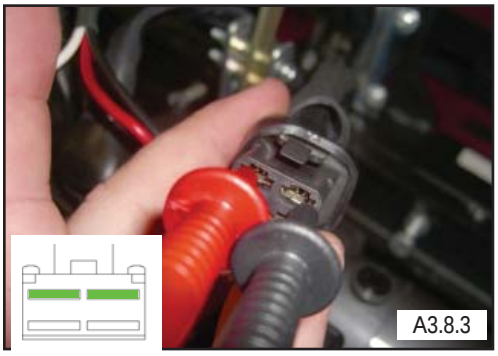
VR2 Controller Diagnostics Codes (cont.)

Eight Bars - Possible Control System Trip

Controller Fault - A control system trip is indicated. Make sure that all connections are secure. Check that the batteries are fully charged and in good condition, and check all joystick connections and cables. If this does not correct the problem,disconnect the power to the controller for 2 minutes, replug in to reboot the module. If the condition still exits, then replace the controller.

Nine Bars - Solenoid Brake Trip

The parking brakes have a bad connection. Check the parking break and motor connections. Make sure the control system connections are secure. Measure the two small contacts on the four-pin motor connector (fig 3.8.1). If both motor connectors read approximately 60 ohms, then replace the controller. Otherwise replace the motor that does not read approximately 60 ohms.

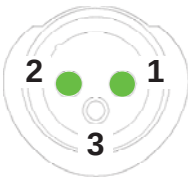


Ten Bars - High Battery Voltage

An excessive voltage has been applied to the control system. This is usually caused by a poor battery connection. Check the battery connections.

Battery Fault

Check that the batteries are fully charged, the correct voltage and in good condition. Take a voltage reading from pin 1 and pin 2 of the charger port of the VR2 controller, see (figure A3.9.1) If the meter reads more than 30 volts, then check the charger. Otherwise, replace your controller.



Section 4

R-net Troubleshooting Procedures

Chair Will Not Power Up

1. Check for battery voltage at the hand control using a Multimeter. Connect the Multimeter between the two outside pins (fig 4.1), pin 1 is positive (+), pin 2 is negative (-). Note: Positive is on the right.

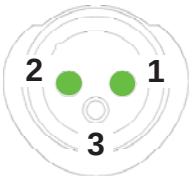


fig. 4.1

2. If battery voltage is present, replace the following components in this order:

a. Cables

b. Hand control

c. Control module. Refer to Control Module Replacement section of this manual.

d. Retest as necessary.

3. Verify that the buss cables are correctly mated between the hand control and the control module (fig 4.2).

Note: This connector is mated <u>incorrectly</u>. The connectors are designed to visually indicate when they are not mated correctly. If yellow is showing between the halves (A), push them closer together until only black is visible. Retest as necessary.

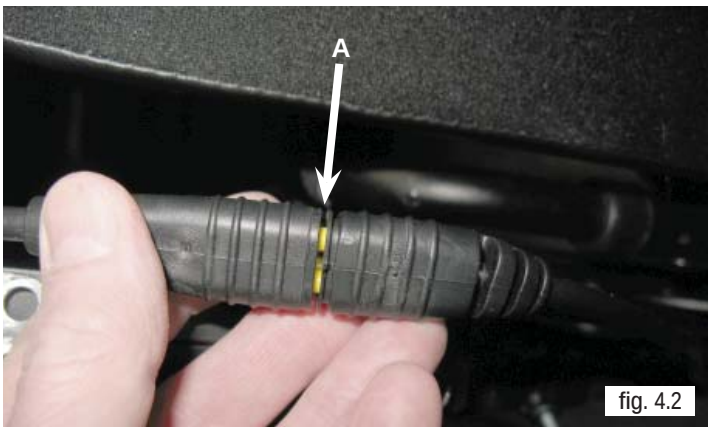


fig. 4.2

5. Disconnect the power connector from the control module, and use a Multimeter to check for battery voltage at the connector (fig4.3). If voltage is present, replace the control module. Retest as necessary.

Note: The power connector is the larger 2-pin connector between the left and right motor cable.

fig. 4.3

6. Manually tilt the seat back and remove the shroud from the base. Refer to Battery Removal section of this manual.

7. Verify that the circuit breaker located at the front of the power chair is not tripped (fig 4.4). Reset if it is tripped and retest.

fig. 4.4

8. Disconnect the batteries (fig 4.5).

fig. 4.5

9. Verify that battery voltage is present at each connector leading to the batteries (fig. 4.6).

fig. 4.6

10. If battery voltage is not present, use a Multimeter and measure for continuity across the fusible links connected to positive (+) terminal of each battery (fig. 4.7). Normal resistance is less than 1 ohm. If open, replace the defective battery harness. Retest as necessary.

.

fig. 4.7

Caution: To prevent damage to the Multimeter, ensure that the batteries are disconnected.

11. Check for continuity across the circuit breaker (fig. 4.8). Normal resistance is less than 1 ohm. If open, replace the circuit breaker. Retest as necessary. Note: Access to the circuit breaker terminals is easier if the front battery is removed.

.

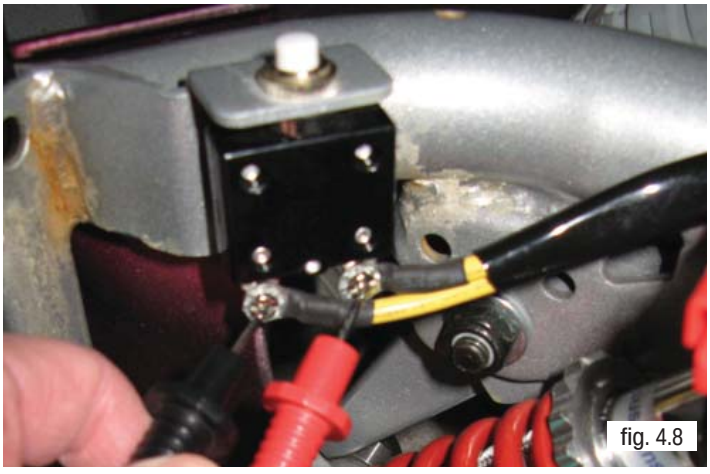


fig. 4.8

12. If the above tests pass, replace the wiring harness leading from the batteries through the circuit breaker and control module. Retest as necessary.

.

Section 5

R-net Fault Codes

Power Chair Displays a Fault on the Hand Control or Omni

The R-Net control used on this power chair is constantly monitoring for conditions that can cause unsafe or erratic operation. When a fault is displayed, refer to the fault code table in this manual for a list of corrective actions.

The following identifies which module of the control system has registered the problem.

- PM-Power Module (Control Module)
- JSM-Joystick Module/Omni Module
- ISM-Intelligent Seating/lighting Module

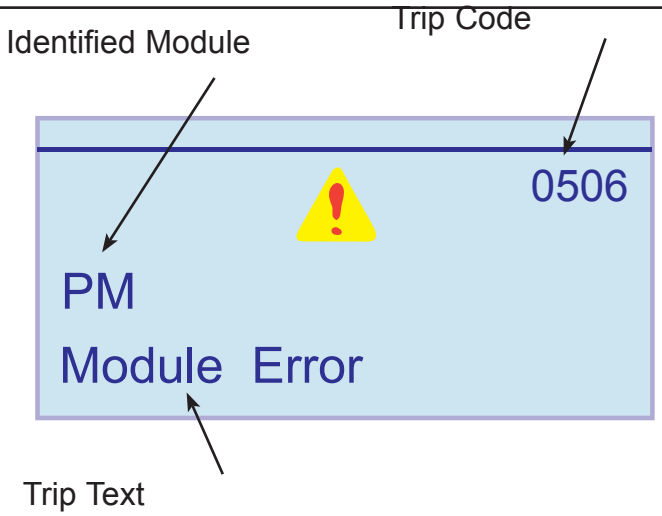


Table 1, Error Codes

Trip Text	Corrective Action
Joystick Error	Ensure that the joystick is centered upon power up. If it is centered, replace the hand control.
Low Battery	Recharge the batteries. After charging, perform the Battery Testing section of this manual.
High Battery	Verify that the battery charger is not defective. Leave the chair on for a few minutes to drain off the excess charge. Check the condition of the battery charger.
M1 Brake Error	Verify that the left motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.
M2 Brake Error	Verify that the right motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.
M1 Motor Error	Verify that the left motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.
M2 Motor Error	Verify that the right motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.
Inhibit Active	Cycle power. Check all cable connections. If this does not correct the fault, contact Sunrise Technical Service for assistance.
Jstick Cal Error	Calibrate the joystick. If the error is still present, the hand control may be defective.
Latched Timeout	A latch function has exceeded it preset time.
Brake Lamp Short	N/A
Left Lamp Short	N/A
Right Lamp Short	N/A
L Ind Lamp Short	N/A
R Ind Lamp Short	N/A
L Ind Lamp Failed	N/A
R Ind Lamp Failed	N/A

R-net Fault Codes cont.

Table 1, Error Codes cont.

Over-current	This fault occurs when the limits of an actuator circuit is exceeded. Perform Tilt Will Not Operate troubleshooting section of this manual to test the end of travel limit switches.
Overtemp. (Acts)	This error indicates that the Intelligent Seating Module (ISM) has become excessive warm. Note: An ISM is only required when there are more than 2 actuators and may not be mounted on this power chair. Allow the unit to cool. If the error repeats, the actuator may be defective or over loaded.
Overtemp. (Lamps)	Note: This fault can only occur if an Intelligent Seating Module is used on this power chair and connected to external lights.
DIME Error	This error indicated that one or more of the modules are not compatible. Remove the last module installed and retest. Recycle the power. Contact Sunrise Technical Service for assistance.
Memory Error	Recycle the power. Verify that the cables are correctly mated. If a module has been replaced recently, suspect that module may be defective. Contact Sunrise Technical Service for assistance.
PM Memory Error	Recycle the power. Verify that the cables are correctly mated. If a module has been replaced recently, suspect that module may be defective. Contact Sunrise Technical Service for assistance.
Bad Cable	Inspect and replace the defective cable(s).
Bad Settings	Verify that the programming agrees with the installed equipment. If all settings are correct, the control module may be defective. Contact Sunrise Technical Service for assistance.
Module Error	Recycle the power. Verify that the cables are correctly mated. If a module has been replaced recently, suspect that module may be defective. Contact Sunrise Technical Service for assistance.
System Error	Recycle the power. Verify that the cables are correctly mated. If a module has been replaced recently, suspect that module may be defective. Contact Sunrise Technical Service for assistance.
SID Detached	The Omni has detected that a specialty control has become disconnected. Recheck all cables. If the error is still present, replace the specialty control.
User Switch Detached	Indicates that a user switch has become disconnected. Reconnect the switch.
Gone to Sleep	The predetermined sleep time has been exceeded due to inactivity by the user.
Charging	This indication is present when the battery charger is connected. There may also be an error in the control module. Contact Sunrise Technical Service for assistance.

R-net Fault Codes cont.

Note: On hand controls that contain LED battery gauges, they will display the fault code by illuminating various LEDs . Refer to the Corrective Action column for a list of items to check for each fault.

Table 1, Error Codes cont.

Bar Indication	Corrective Action
1 Bar	The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, recharge the battery.
2 Bar	Verify that the left motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.
3 Bar	The left motor has a short circuit to a battery connection. Contact Sunrise Medical Technical Service for assistance.
4 Bar	The right motor has a bad connection. Complete the Motor and Gearbox Inspection section of this manual.
5 Bar	The right motor has a short circuit to a battery connection. Contact Sunrise Medical Technical Service for assistance.
6 Bar	The wheelchair is being prevented from driving by an external signal. Verify that the battery charger is not connected. Contact Sunrise Medical Technical Service for assistance.
7 Bar	Ensure that the joystick is centered upon power up. If it is centered, replace the hand control, and or cable.
8 Bar	A control system fault is indicated. Make sure that all connections are secure. Contact Sunrise Medical Technical Service for assistance.
9 Bar	The parking brakes have a bad connection. Complete the Motor and Gearbox Inspection section of this manual.
10 Bar	Verify that the battery charger is not defective. Leave the chair on for a few minutes to drain off the excess charge. Check the condition of the battery charger.
7 Bar + S	A communication fault is indicated. Make sure that joystick cable is securely connected and not damaged.
Actuator Flash	An Actuator trip is indicated. If more than one actuator is fitted, check which actuator is working correctly. Check the actuator wiring.

R-net Fault Codes cont.

Example of R-10 Fault Isolation

1. In this example, one of the right motor being disconnected (fig.5.1). The hand control displays the fault and the power chair will not operate.

2. To troubleshoot this problem, refer to Table 1, Error Codes.

3. From this error we see that the problem is being recorded in the PM (Control Module).

4. The hand control tells us that motor 2 (M2) has the error and it is with the brake circuit. Motor 2 is the right motor.

5. Table 1 informs us to, “Verify that the right motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.”

6. The next step is to complete the Motor and Gearbox Inspection section of this manual and retest.

Power Chair Will Not Drive Full Speed

An external micro-switch is mounted next to the actuator in the rear of the tilt system. This micro-switch is open when the tilt is lowered. The opening of this micro-switch blocks a signal from being sent to the control module through the 6-pin connector located on the back of the tilt. The absence of this signal informs the control module that the tilt is less than 20 degrees and that maximum speed should be used. If the tilt is more than 20 degrees, the switches closes and invokes “creep” speed. Creep speed is a predetermined speed programmed at time of manufacture. Creep is indicated by a “turtle” on either the hand control or Omni.

1. “Creep” speed as indicated by the turtle on the hand control ("A" fig 5.2).

2. Tilt the seating system to the rear.

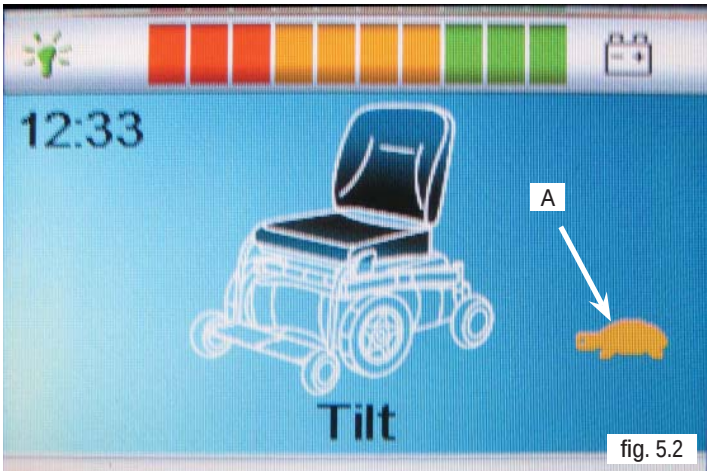


fig. 5.2

R-net Fault Codes cont.

3. Locate the creep micro-switch mounted at the rear of the actuator (fig. 5.3).

Note: The creep micro-switch may be seen from the top of the seating system on the right rear of the actuator. It may be necessary to remove the seat pan to access the switch.

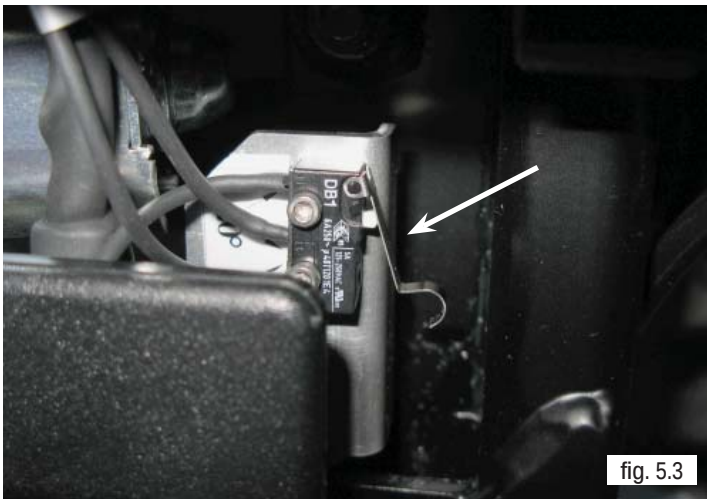


fig. 5.3

4. Manually operate the creep micro-switch while observing the hand control or Omni for the turtle symbol to go on and go off with the micro-switch operation. If the symbol changes, the problem is in the programming. Contact Sunrise Medical Technical Service for assistance. If the symbol does not change, proceed to step 5.

5. Lower the tilt system.

6. Locate the 6-pin connector at the rear of the tilt (fig. 5.4).

fig. 5.4

7. Disconnect the connector leading to the control module.

8. Test the micro-switch wiring by performing the following test.

a. Ensure that the seat is in the full down position.

b. Use Multimeter and measure continuity between the indicated pins below on the 6-pin connector mounted on the tilt. When down the indication should be open (fig. 5.5).

c. If it is closed, replace the micro-switch assembly. Refer to Tilt Actuator and Micro-Switch Removal section of this manual.

d. Retest as necessary.

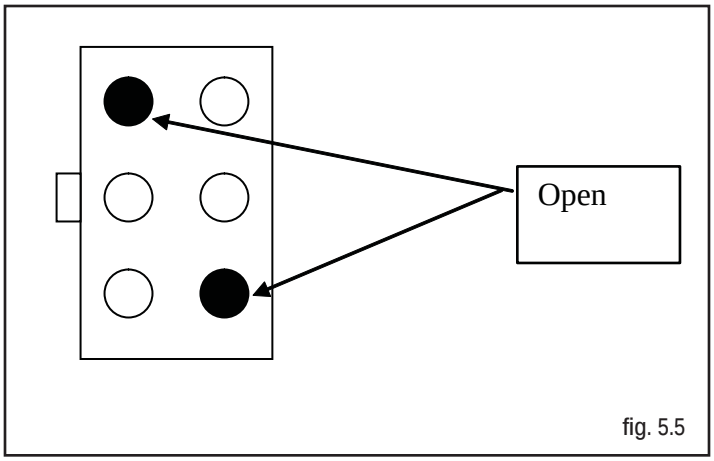


fig. 5.5

9. If the above test passes, replace in this order:

a. Cable leading from tilt to control module.

b. Control module

10. Retest as necessary

R-net Fault Codes cont.

Power Chair Will Not Drive in Creep Speed When Tilted

An external micro-switch is mounted next to the actuator in the rear of the tilt system. This micro-switch is open when the tilt is lowered. The opening of this micro-switch blocks a signal from being sent to the control module through the 6-pin connector located on the back of the tilt. The absence of this signal informs the control module that the tilt is less than 20 degrees and that maximum speed should be used. If the tilt is more than 20 degrees, the switches closes and invokes “creep” speed. Creep speed is a predetermined speed programmed at time of manufacture. Creep is indicated by a “turtle” on either the hand control or Omni.

1. Tilt the seat all the way back and observe the hand control or Omni to see if the turtle symbol is displayed.

2. If the turtle is displayed (fig. 5.6), contact Sunrise Technical Service for assistance. The programming for the power chair is incorrectly set.

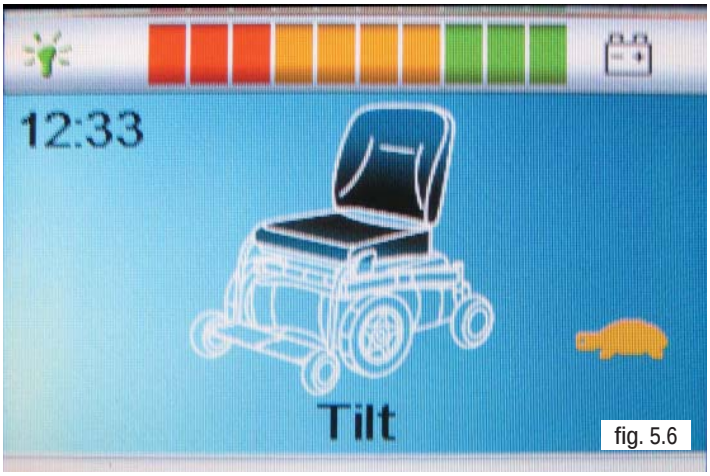


fig. 5.6

3. Use the hand control and tilt the seating system beyond 20 degrees.

4. Locate the 6-pin connector on the rear of the tilt (fig. 5.7).

5. Disconnect the connector leading to the control module

fig. 5.7

6. Test the micro-switch by performing the following test.

a. Ensure that the tilt is beyond 20 degrees tilt.

b. Use Multimeter and measure continuity between the indicated pins below on the 6-pin connector mounted on the tilt. When seat is tilted the indication should be closed (fig. 5.8).

c. If it is open, replace the micro-switch assembly. Refer to Tilt Actuator and Micro-Switch Removal section of this manual.

d. Retest as necessary.

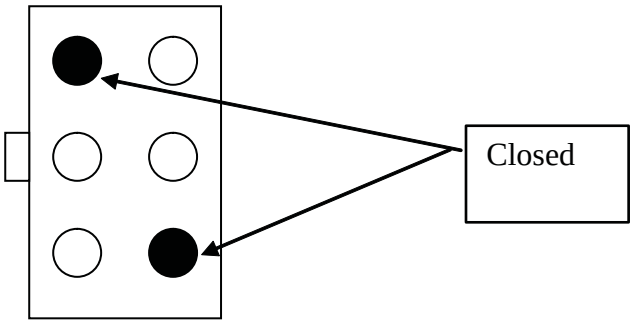


fig. 5.8

Tilt Will Not Operate

The tilt actuator used in the tilt system receives power through a 6-pin connector located at the rear of the tilt. The actuator also contains micro-switches that open at the end of their stroke to prevent stressing of the tilt system. Around these micro switches are diodes that allow reverse power to flow to the actuator when reversing direction.

1. Selected tilt on the hand control (fig. 5.9). Operate the joystick and listen closely to the control module for a click. This click indicates that the control module is closing the power relay inside and supplying power to the tilt actuator. If no click is heard, replace the control module. Refer to Control Module Replacement section this manual. Retest as necessary. If click is heard proceed to step 3.

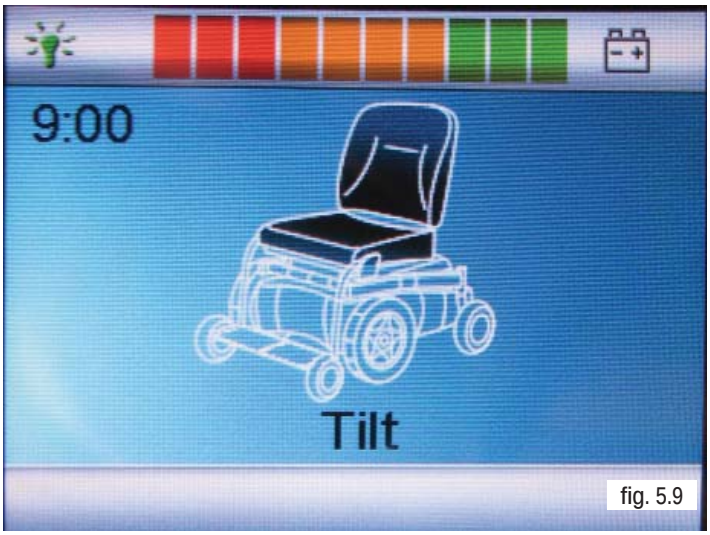


fig. 5.9

2. Verify that tilt is selected on the hand control. Operate the joystick and listen closely to the tilt actuator. If the actuator appears to be running but the tilt is not moving, replace the tilt actuator. Refer to Tilt Actuator and Micro-Switch Removal section of this manual. Retest as necessary.

3. Locate the 6-pin connector on the rear of the tilt (fig. 5.10).

fig. 5.10

4. Disconnect the 6-pin cable leading to the control module.

5. Select tilt on the hand control and place a rubber band around the joystick to hold it displaced (fig. 5.11).

fig. 5.11

R-net Fault Codes cont.

Warning: Use caution in the next step. Do not short the leads of the Multimeter together or damage may occur to the control module.

6. At the 6-pin connector on the cable leading to the control module, verify that battery voltage is present between the indicated pins (fig. 5.12). Note: The polarity of the voltage is not important since it is reverses when the opposite direction is selected.

fig. 5.12

7. If voltage is not present, replace the cable leading to the control module. If this does not solve the problem, replace the control module. Refer to Control Module Removal section of this manual. Retest as necessary.

fig. 5.13

8. At the 6 pin connector (fig. 5.13) on the rear of the tilt, check continuity between the indicated pins (fig. 5.14).

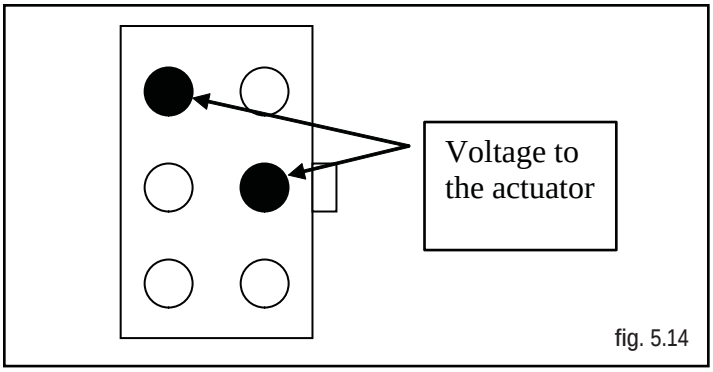


fig. 5.14

R-net Fault Codes cont.

Note: Since the tilt actuator will not operate, it is only possible to check for one condition. Pick the condition below that best describes the position of the tilt system.

9. Example 1, the tilt is in mid-stroke. The value recorded is the resistance through the actuator motor windings. If this reading is not correct, replace the tilt actuator and retest.

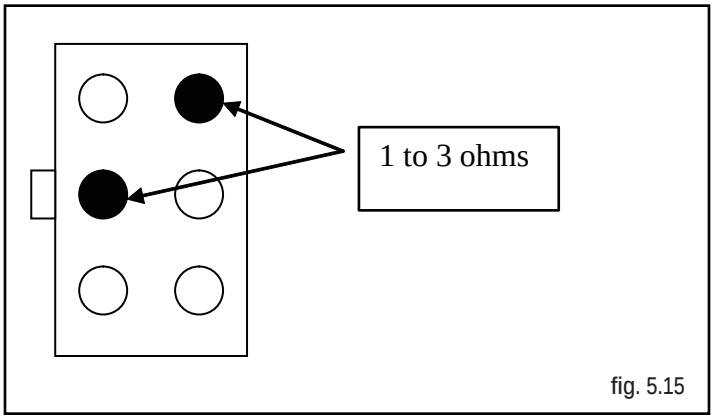


fig. 5.15

Note: The value recorded in one direction is the forward resistance through a diode and will vary with the type of Multimeter used. This value is not important, as long as there is continuity in one direction only. This value may even be high. The value recorded in the other direction is across the open contact of the end of stroke micro-switch and should be open.

10. Example 2, the tilt is in the full down position. If the readings are not correct, replace the tilt actuator. Refer to Tilt Actuator and Micro-Switch Removal section this manual. Retest as necessary.

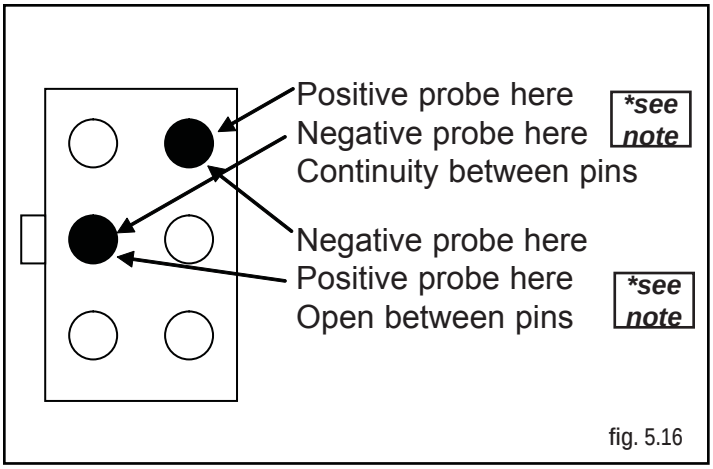


fig. 5.16

Note: The value recorded in one direction is the forward resistance through a diode and will vary with the type of Multimeter used. This value is not important, as long as there is continuity in one direction only. This value may even be high. The value recorded in the other direction is across the open contact of the end of stroke micro-switch and should be open.

Example 3, the tilt is in the full up position. If the readings are not correct, replace the tilt actuator. Refer to Tilt Actuator and Micro-Switch Removal section this manual. Retest as necessary.

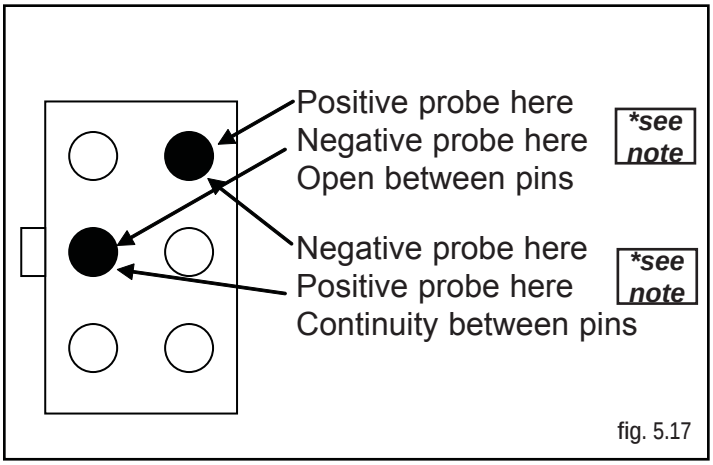


fig. 5.17

Battery Testing

The Pulse power chair uses two (2) group-22 batteries connected in series. The circuit is protected by a circuit breaker located under the shroud near the front of the power chair and a non-serviceable fusible link in each battery harness. Prior to performing any test, the battery terminals should be clean and tight. Refer to Battery Removal section of this manual.

1. Check for initial battery voltage at the joystick using the battery charger connector. Connect the Multimeter to the two outside pins (fig. 5.18). Pin 1 is positive (+) and pin 2 is negative (-). Fully charged batteries are typically 25.6 VDC for the pair, or 12.8 VDC each. Discharged batteries are 24 VDC or less for the pair.

fig. 5.18

Note: Voltage greater than 26 to 28 VDC indicates that the batteries are either over-charged, or the batteries have just been disconnected from the battery charger and contain a surface charge. If the batteries are not freshly charged and the voltage is excessive, inspect the battery charger for correct operation.

2. Load test the batteries using either a commercial load tester or the following procedure. To use the power chair's motors as a load, complete the following steps:

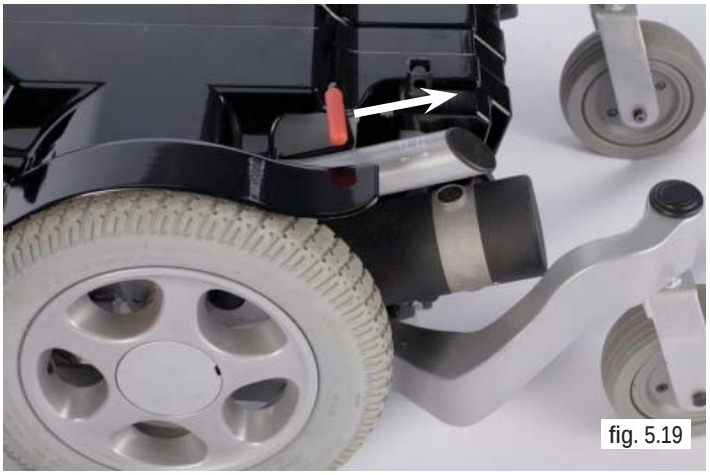


fig. 5.19

Warning: Failure to disengage the gearbox in the next step can cause unexpected operation of the power chair.

a. Disengage the motor/gearbox so the motors can run in freewheel (fig. 5.19).

b. Connect the Multimeter to the joystick and record the voltage (fig. 5.20). If the voltage indicates a surface charge, run the motors for a few minutes to dissipate the surface charge. Note: in this example, a small surface charge is present.

c. After the voltage has stabilized, record the voltage. Typical value for a fully charged pair of batteries is 25.6 VDC (12.8 VDC each).

fig. 5.20

R-net Fault Codes cont.

d. Operate the power chair at high speed by operating the joystick in a high-speed profile. The motors put approximately a 5 to 10 amp load on the batteries.

fig. 5.21

e. Continue to operate the motors for 60 seconds. (fig. 5.21) Record the readings and compare them to following:

i. During the first 5 seconds, normal voltage drop is approximately .5 to .6 VDC.

ii. During the remaining portion of the 60 seconds, the voltage should stabilize, dropping no more than an additional .1 to .2 VDC.

iii. At the end of the 60 seconds, release the joystick.

f. At the end of a 5 minute rest, note the voltage recorded on the Multimeter. Normal indication at the end of a 5 minute rest is typically the starting voltage, or no more than .1 VDC less.

Notes:

- ***A rapid drop of approximately 1.5 or more during the first 5 seconds indicates a shorted cell in one or both of the batteries. The battery terminals should be checked to ensure that they are tight and clean, and then the test should be repeated. If the terminals are tight, the batteries should be replaced. Refer to Battery Removal section of this manual.***
- ***A slow drop of more than .8 volts during the first few seconds indicates a weakened pair of batteries. Evaluate the age of the batteries and the use they have received, and consider replacing them.***
- ***If the voltage does not return to .1 VDC of the starting voltage at the end of the 5 minute test, evaluate the age of the batteries and the use they have received, and consider replacing them.***

3. The individual voltage of each battery may also be checked using a Multimeter. Connect the Multimeter to the battery connector (fig. 5.24). Note: Refer to Battery Removal.

fig. 5.24

Compare the values to the following.

a. 12.8 VDC indicates a fully charged battery.

b. The battery readings should be similar. Newer batteries typically read within .1 to .2 VDC.

c. 13 VDC or more indicates an overcharged battery, or one that has a surface charge from being recently removed from the charger. Verify correct operation of the battery charger if the batteries have not recently been removed from charge.

d. 11.9 to 12 VDC indicates a discharged battery. Recharge as necessary.

e. Less than 11.9 VDC indicates an excessively discharged battery.

f. Values larger than 13 VDC indicate either an overcharged battery or one that has just been removed from charge, as in this example.

Section 6

Motor/Gearbox Inspection

Note: This procedure may be done with or without removing the motor from the power chair. If the motor/gearbox is to be removed from the power chair, refer to the Motor and Gearbox Removal section of this manual.

Consider replacing any motor/gearbox assembly that does not pass the following test. Refer to the Motor Gearbox Removal section of this manual.

1. Inspect the output shafts for signs of grease leakage (fig. 6.1).

fig. 6.1

2. Inspect the cotter pin connecting the gearbox release arm to the motor/gearbox assembly. Ensure that it is tight and not damaged (fig. 6.2)

3. Manually operate each gearbox release lever to ensure that they operate easily and fully engage and disengage

Note: When removing the brush assemblies, remove one brush assembly at a time. Note its orientation so that it can be inserted into the brush holder the same way it was removed.

fig. 6.2

Caution: Use care not to damage the brush cap with excessive force in the next step.

4. Remove the brush by using a common screwdriver to unscrew the cap (fig. 6.1).

fig. 6.3

Motor/gear Box Inspection (cont.)

Note: When replacing brush assemblies, always replace both motors. Run-in the brush assemblies prior to delivering the power chair to the customer by releasing the gearbox assembly and operating the motor for 20 to 30 minutes, alternating between forward and reverse.

5. Inspect the brush assembly (fig. 6.4). Replace any brush assembly less than ¼ inch long. Ensure that the lead to the brush and spring has not over heated and that the ends of the brush are sharp and clean.

fig. 6.4

6. Inspect the motor's commutator (fig. 6.5). Verify that it is clean, not overheated, and does not show signs of excessive arcing. Normal color is bright copper to dull brown copper. Contact Sunrise Medical Technical Service if in doubt of its condition.

fig. 6.5

7. Inspect the motor connector at both the motor end and the control module end for signs of over heating (fig. 6.5).
Note: Disconnect the motor connector from the control module if the motor/gearbox assembly is mounted in the power chair.

fig. 6.6

Motor/gear Box Inspection (cont.)

8. Measure the resistance of the park brake assembly by connecting a Multimeter to the small pins of the 4-pin connector (fig. 6.7). Normal resistance is approximately 12 to 15 ohms.

fig. 6.7

9. Measure the resistance through the motor brush assembly and motor by connecting a Multimeter to the large pins of the 4-pin connector (fig. 6.8). Normal resistance is approximately .5 to .9 ohms.

Note: New brush readings may be different than those recorded above. The new brush assemblies should be run-in prior to measuring their resistance. Contact Sunrise Technical Service if the readings are either significantly higher or lower than those recorded above.

fig. 6.8

Section 7

Removal Procedures

Battery Removal

1. Remove the two thumb screws under the front of the seat (fig. 7.1).

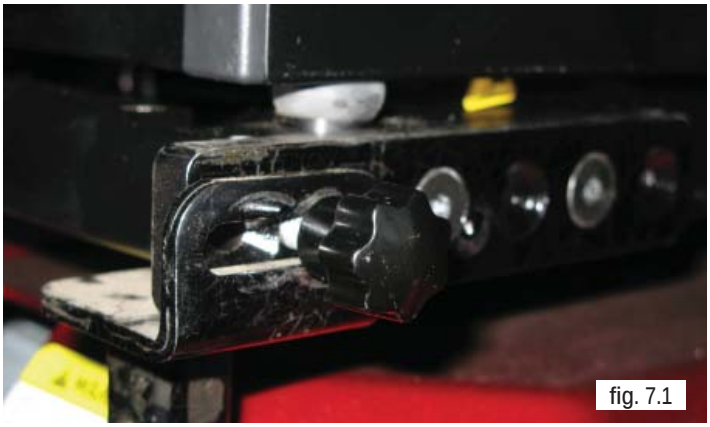


fig. 7.1

2. Inspect the power chair base at the back and disconnect any connectors that may be damaged before tilting the seat back (fig. 7.2).

fig. 7.2

3. Flip back the arms to prevent damage to the arms as the seat back is tilted (fig. 7.3).

fig. 7.3

Removal Procedures (cont.)

Caution: While not required, it may be a good idea to place a box under the seat back prior to tilting the seat.

4. Tilt the seat back while ensuring that none of the cables attached to the electronics are damaged (fig. 7.4).

fig. 7.4

5. Locate and remove the 6 plastic inserts that secure the shroud to the base (fig. 7.5).

fig. 7.5

6. Locate the two batteries mounted in the base (fig. 7.6). Note the battery connectors.

fig. 7.6

7. Disconnect the battery connectors (fig. 7.7).

8. Remove the batteries.

9. Replace the batteries by reversing the previous procedures.

fig. 7.7

Removal Procedures (cont.)

Motor and Gearbox Removal

1. Remove the batteries. Refer to the Battery Removal section of this manual.

2. Locate and disengage the connector leading from the motor to the control module (fig. 7.8).

fig. 7.8

3. Elevate the wheelchair by placing wood blocks under the battery box (fig. 7.9).

fig. 7.9

4. Remove the wheel's hubcap by prying it off using a common screw drive (fig. 7.10) .

fig. 7.10

5. Remove the wheel by removing the 4 bolts using a 6 mm Allen wrench (fig. 7.11).

fig. 7.11

Removal Procedures (cont.)

6. Remove the gearbox release lever from the motor/gearbox assembly by removing the cotter pin (fig. 7.12). Use a new cotter pin when replacing the lever.

fig. 7.12

Note: For the next procedure, use either a ball-type 5 mm Allen wrench or a cut-down 5 mm Allen wrench.

7. Remove the 4 bolts securing the motor/gearbox assembly to the motor mount using a 5 mm Allen wrench (fig. 7.13).

fig. 7.13

8. Lift the motor out from the side of the power chair (fig. 7.14).

9. Replace the motor/gearbox assembly by reversing the previous procedures.

fig. 7.14

Control Module Removal

Note: The control module is mounted under the rear cover of the power chair (fig. 7.15)***.***

fig. 7.15

1. Remove the rear cover by lifting the two quick release pins from the cover (fig. 7.16).

fig. 7.16

2. Carefully disconnect the connectors leading to the control module (fig. 7.17).

fig. 7.17

Removal Procedures (cont.)

3. Loosen the control module by loosening two 3 mm Allen screws (fig. 7.18). Note: It may be necessary to remove the batteries to gain access to the nuts on the other side of the control module.

fig. 7.18

4. Slide the control module up to remove it (fig. 7.19).

5. Reverse the above procedures to install the control module

fig. 7.19

Removal Procedures (cont.)

Shock Removal

The shocks used in this power base are pre-adjusted at the factory. Contact Sunrise Medical Technical Service if adjustment is required.

1. Remove the batteries. Refer to the Battery Removal section of this manual.

2. Remove the motor/gearbox assembly from the side on which you are removing the shock. Refer to Motor/Gearbox Removal section of this manual.

3. Use a 17 mm wrench and remove the top bolt securing the shock to the base (fig. 7.20).

fig. 7.20

4. Use two 19 mm wrenches and remove the bottom nut and bolt securing the shock to the base (fig. 7.21 & 7.22).

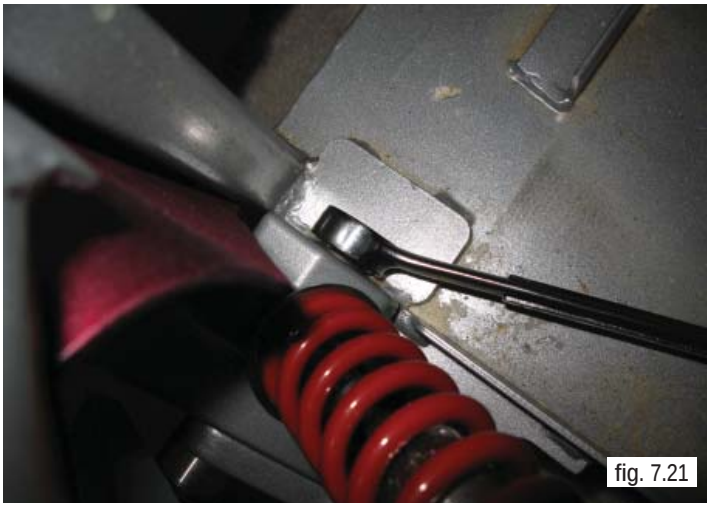


fig. 7.21

fig. 7.22

5. Lift the shock from the base.

6. Reverse the previous procedures to install the shock.

Removal Procedures (cont.)

Front Caster Arm Removal

1. Remove the batteries. Refer to the Battery Removal section of this manual.

2. Remove the motor/gearbox assembly. Refer to the Motor/Gearbox Removal section of this manual.

3. Remove the two braces connecting the front caster arm to the rear caster arm using 19 mm wrenches (fig. 7.23 & 7.24).

fig. 7.23

fig. 7.24

4. Remove the coupler that connects to the two braces (fig. 7.25).

fig. 7.25

Removal Procedures (cont.)

5. Push down on the rear of the motor mount assembly to allow clearance for the front caster arm assembly to slide out (fig. 7.26).

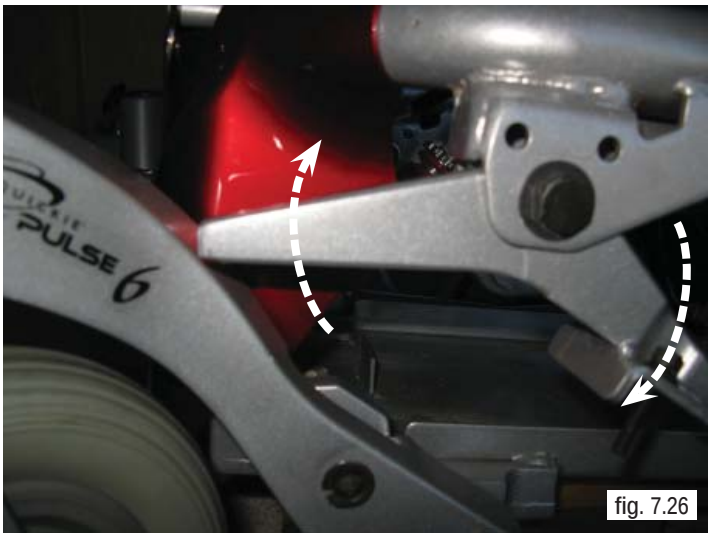


fig. 7.26

6. Remove the front caster arm assembly. (fig. 7.27)

7. Reverse the previous procedures to install the front caster arm assembly.

fig. 7.27

Rear Caster Arm Removal

1. Remove the batteries. Refer to the Battery Removal section of this manual.

2. Remove the two braces connecting the front caster arm to the rear caster arm using 19 mm wrenches. (fig. 7.28 & 7.29)

fig. 7.28

fig. 7.29

3. Remove the rear caster arm assembly (fig. 7.30).

4. Reverse the previous procedures to install the rear caster arm assembly

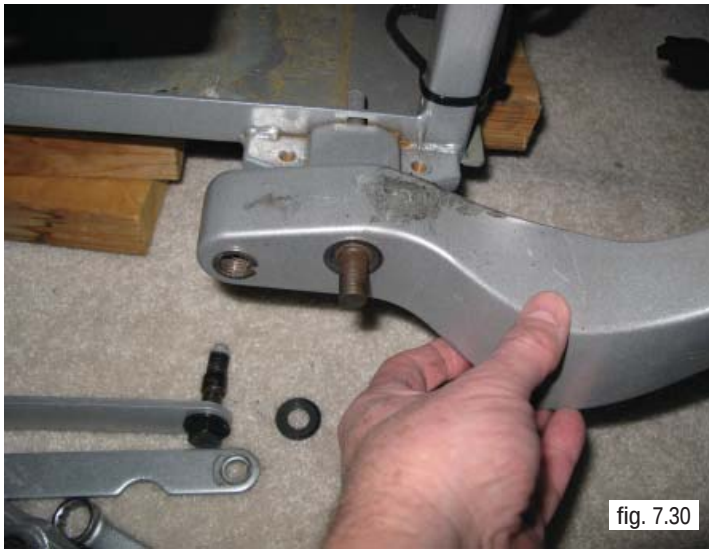


fig. 7.30

Front or Rear Caster Fork Removal

1. Elevate the caster fork to be removed by placing wood blocks under the battery box of the power chair (fig. 7.31).

fig. 7.31

2. Remove the plastic cap on the caster arm assembly using a common screwdriver (fig. 7.32).

fig. 7.32

3. Hold the caster steady with one hand while removing the caster fork nut with a 19 mm socket wrench (fig. 7.33).

fig. 7.33

4. Remove the caster fork from the caster arm assembly (fig. 7.34)

Note: If either of the bearings needs to be replaced, it may be necessary to use a bearing puller on the lower bearing to separate it from the fork stem, and a brass drift to drive out the upper or lower bearings from the caster arm assembly if they are stuck.

5. Reverse the previous procedures to install the caster fork.

fig. 7.34

Caster Removal

1. Elevate the caster fork to be removed by placing wood blocks under the battery box of the power chair (fig. 7.35).

fig. 7.35

2. Remove the caster using two 13 mm wrenches (fig. 7.36).

fig. 7.36

fig. 7.37

3. Reverse the previous procedures to install the caster (fig. 7.37).

Tilt Actuator and Micro-Switch Removal

The following procedures describe the removal of the tilt actuator and the micro-switch assembly used for the creep speed. Read the directions entirely prior to performing the task. Portions of the directions may be eliminated if only the tilt actuator needs to be replaced, or the micro-switch replaced separately. Reverse the procedures to install the tilt actuator or micro-switch and retest as necessary.

1. Disconnect the 6-pin connector located on the rear of the tilt system (fig. 7.38).

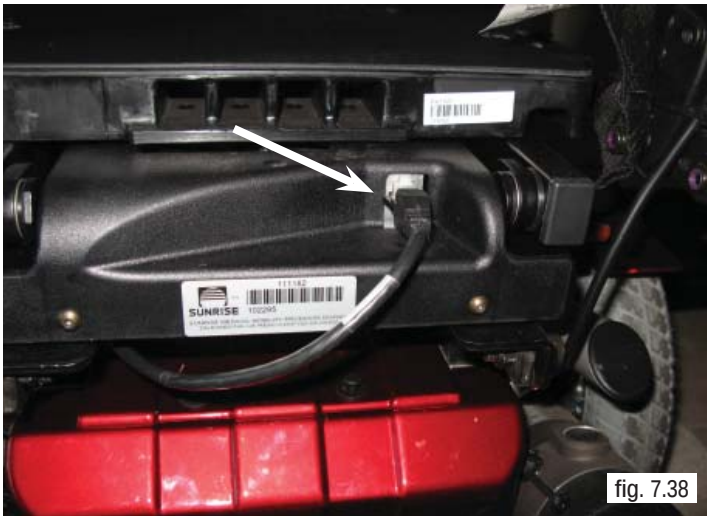


fig. 7.38

2. Remove the cover over the 6 pin connector on the rear of the tilt system using a 3 mm Allen wrench (fig. 7.39).

fig. 7.39

3. Locate the micro-switch assembly and remove using a 3 mm Allen wrench (fig. 7.40).
Note: this step may be eliminated if the micro-switch is to be disconnected and left in place.

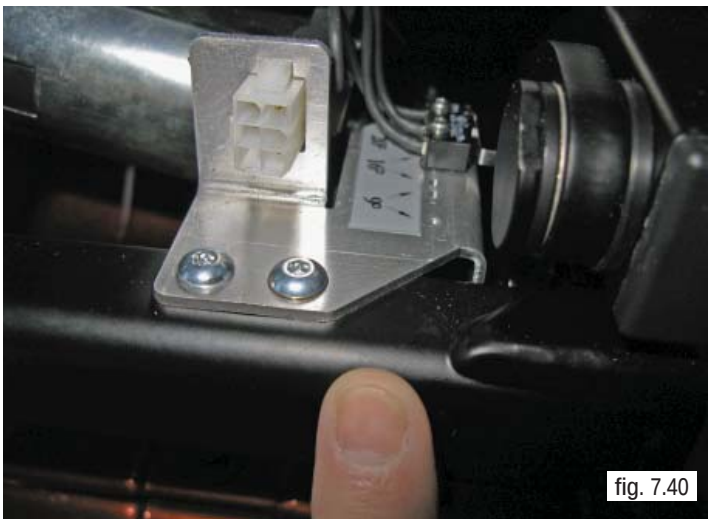


fig. 7.40

Removal Procedures (cont.)

4. Reconnect the 6-pin connector on the rear of the tilt and partially tilt the seating system back to expose the actuator. Disconnect the 6-pin connector

5. Locate the tilt actuator under the seat (fig. 7.41).

fig. 7.41

Note: Complete this step only if the micro-switch assembly is to be replaced separately.

6. Locate the micro-switch assembly at the rear of the tilt (fig. 7.42). Note the connections leading to the micro-switch. Separate the wires leading to the micro-switch. Reverse the procedures to replace it and retest as necessary.

fig. 7.42

Warning: The tilt system is free to fall during the next step. Secure the seating system prior to removing the tilt actuator.

7. Use two 13 mm wrenches and remove the nuts at both ends of the actuator (fig. 7.43). Remove both pins from the tilt actuator.

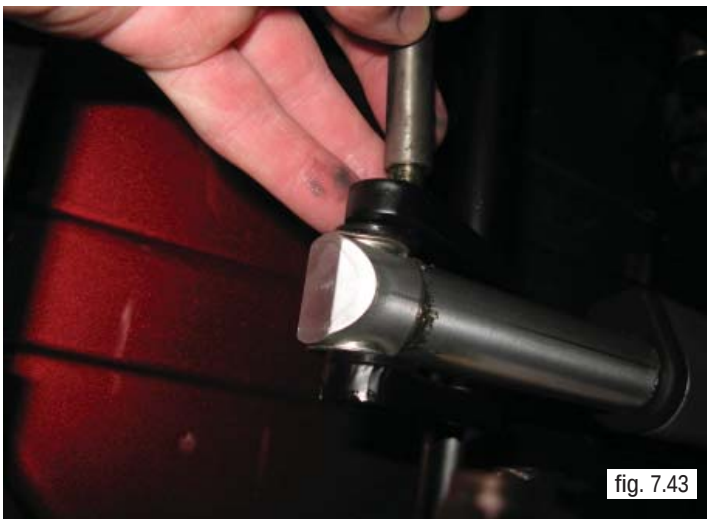


fig. 7.43

Caution: the actuator and micro-switch assembly wires are fragile. Use caution when removing the actuator and micro-switch assembly.

8. Remove the actuator and micro-switch assembly as one part if the entire assembly is to be replaced (fig. 7.44). Reverse the procedures to install and retest as necessary.

fig. 7.44

Note: Perform this step if only the actuator is to be replaced.

9. Note the connections of the wires and separate them (fig. 7.45). Remove the actuator.

10. Reverse the previous procedure to install the actuator/micro-switch assembly. Retest as necessary.

fig. 7.45